NOISE ELEMENT

AN ELEMENT OF THE PLACER COUNTY GENERAL PLAN

JUNE, 1977

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PLACER COUNTY NOISE ELEMENT

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INTRODUCTION

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INTRODUCTION

It seems a paradox that while noise is so vital to our existence, it has also become a very real menace to our health and safety. At the best, unwanted noises are irritations which can lead to anxieties and stress; and at the worst, extreme exposure to unwanted noises can lead to permanent hearing loss or severe social and psychological disturbances. A more detailed discussion of the effects of noise will follow. Suffice it to say here that largely due to our reliance on mechanical devices and the expanding tenticles of mass transportation facilities, noise pollution has spread from the factory and city core to endanger the quality of life of the suburban and rural environment. Railroads, trucks, cars, motorcycles, airplanes, jackhammers, air conditioners, and manufacturing noises of all kinds combine to produce the pandemonium which attacks our ears daily.

Purpose of the Noise Element

In 1971, the California State Legislature enacted legislation requiring a Noise Element be prepared by cities and counties and that this element be adopted and made a part of their General Plans (Section 65302 (g), California Government Code). This legislation requires that the noise element illustrate, in quantitative and numerical terms, contours of present and projected noise levels associated with all existing and proposed major transportation systems. These systems include, but are not limited to (1) highways and freeways; (2) ground rapid transit systems; and (3) ground facilities associated with all airports operating under a permit from the State Division of Aeronautics.

The Government Code also states that "these noise contours may be expressed in any standard acoustical scale which includes both the magnitude of noise and frequency of its occurence. The recommended scale is sound level A, as measured with the A - weighting network of a standard sound meter".

It is also a requirement of the noise element that it speak to appropriate site or route selection alternatives as well as noise impacts upon the range of land uses.

It becomes evident that the major thrust of this legislation is to require an examination of noise generating facilities, particularly "fixed point" noise sources and those sources related to transportation; establish standards and criteria for noise emissions from such facilities; develop noise acceptability standards for the various land use choices; and finally, to develop procedures to implement the recommendations presented.

The overriding purpose of this study is, then, to develop standards which, when implemented, will allow the people of Placer County to live and work without the intrusion of unnecessary noise pollution.

CHAPTER II

CHARACTERISTICS

OF

SOUND

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CHARACTERISTICS OF SOUND

Basically, the noise or sound which we experience in our everyday lives is a result of a vibrating body imparting its motion to the medium which surrounds it, in most cases air, causing a minute variation in atmospheric pressure called "sound pressure". This pressure creates "sound waves" which move outward and away from the source. As the wave extends, its front spreads out, thus, the sound energy passing through each unit of area become less and less, and the sound pressure decreases with distance. The human ear receives and relates these changes in pressure carried on the sound waves to the brain for translation.

Acoustic Terminology

Noise, or sound, has 3 important components: frequency, intensity, and duration.

Frequency

Frequency is defined as the "number of sound waves per second produced by a sounding body". Most people realize that it is the frequency of a sound which gives it the characteristics from a shrill whistle to a deep, dull roar. Frequency is measured in numbers of waves or cycles per second called Hertz (Hz), names after a Viennese researcher who died in 1916. The highest frequency audible to the human ear is 20,000 Hz. Higher frequencies, heard by dogs, bats, and other animals, are called "ultrasonic" sounds. The lowest frequency humans can hear is about 15 Hz. Sounds of lower frequency are felt by the entire body, rather than heard by the ear.

Most sounds contain more than one frequency and those that contain many frequencies are called "broad band" noises. Sounds which contain a single frequency are called "pure tones" and are produced, to a good approximation, by striking a single piano key.

Intensity

Intensity, as the name implies, describes the loudness, or energy, of a sound. It is measured in decibels (dB), a unit which is described fully later in this chapter. The intensity of a sound is a function of sound pressure produced by sound waves emitted from some source.

Duration

The length of exposure to noise is called duration. The length of exposure to noise is of equal importance to both frequency and intensity for even low intensity and moderate frequency noises may become irritating if they occur over an extended period of time.

Decibel

The decibel (dB) is used universally to describe the level of sound. It provides a reasonable approximation of the human ear's response to sound pressure and intensity. The sound pressure level, measured in decibels, is defined mathematically as:

$$\text{Sound Pressure Level (dB)} = 20 \log_{10} \frac{P}{P_{ref}}$$

Where: P = sound pressure microbars
P_{ref} = the minimum audible sound pressure for humans (.0002 microbar)

It is important to remember that sound pressure level readings are dependent upon the particular environment within which the reading is taken and the distance from the noise source. For example, the sound level we hear while parking a car in the garage is different

than that which we hear while parked in the driveway. As well, the sound level we receive while mowing the lawn is greater than that received when listening to the neighbor mow his lawn. While these examples are most obvious and simple, they illustrate the effect of environment and distance on perceived sound levels.

"A" Weighting

While the decibel gives an accurate account of sound pressure, it must be modified to account for the ear's frequency response characteristics. The response of the human ear is most complex. At lower sound pressure levels, the ear is not as responsive to low frequencies as it is to higher frequencies. As the sound pressure increases, however, the frequency response becomes wider. The human ear hears sounds at intermediate frequencies better than at very low or very high frequencies. The most common modification used to more closely approximate the variable frequency response is the "A" weighting. A decibel measurement utilizing the "A" weighting is abbreviated dBA. This scale compensates for the lower sensitivity of the human ear to the extremes of the frequency scale.

CNEL

While the dB notation does a good job of representing the loudness of sound, it does not speak to the duration. The length of time or duration of noise has a great bearing as to its acceptability. While a few seconds of loud noise may be of momentary annoyance, several minutes of that same sound may be intolerable. It is necessary then to not only assess the loudness of sound at one point in time, but also to assess it over some extended duration with weighting of the particular time frame.

The system devised to reflect these variables is the Community Noise Equivalency Level, CNEL. It takes into account the time of day when a noise occurs and applies a weighting factor. Events in the evening, 7:00 p.m. to 10:00 p.m. are considered 3 times as obnoxious as daytime events (7:00 a.m. to 7:00 p.m.). Night time events (10:00 p.m. to 7:00 a.m.) are considered 10 times as obnoxious as daytime events.

Rather than being measured by a sound meter, CNEL calculations over a 24-hour period must be derived through an equation:

$$CNEL = 10 \log \frac{1}{24} \left[(NL_D) + 3(NL_E) + 10(NL_N) \right]$$

Where: NL_D = "A" scale peak sound level for each daytime hour

NL_E = "A" scale peak sound level for each evening hour

NL_N = "A" scale peak sound level for each nighttime hour

CNEL ratings are generally more acceptable than dBA readings alone as they give a better all-round picture of the noise at some point.

L_{dn} (or Average Day-Night Noise Level)

This is a concept essentially the same as CNEL. The difference between the two is that L_{dn} eliminates the evening term, and noises during this period are weighted the same as daytime events. L_{dn} levels will usually be comparable to, or slightly less than, CNEL ratings.

L_{eq} (or Equivalent Sound Level)

This descriptive device indicates the average sound pressure level, or dBA level, over some period of time. The time frame is indicated by a number in parenthesis following L_{eq} (i.e., L_{eq} (24) means an average over a 24-hour period).

L_{10}

This is a statistical notation which expresses the sound level in a similar manner as described for L_{dn} above. As a general rule, $L_{10} - 3 = L_{dn}$. L_{10} describes a sound level which is exceeded 10% of the time (L_1 = exceeded 1% of the time, L_{50} = exceeded 50% of the time and so on).

Attenuation of Sound

As a sound wave moves out from its source, it diminishes in its intensity due to many factors. It is absorbed in the air and other media, scattered by small obstacles, reflected by solid barriers and has its direction altered by wind and temperature gradients in the air.

While the degree of absorption, scattering and reflection are dependent on the wavelength and, hence, on the frequency of the sound, general observations are made regarding these attenuation characteristics.

Geometrical Attenuation

One of the more important aspects of sound wave propagation is the geometrical attenuation due to the spreading of the wave front. This concept is easily portrayed by the action of water when a stone breaks its plane. The small waves, comparable to sound waves, may be seen spreading from the stone (the noise source) and weakening as their energy (pressure level) is absorbed by the water (air or other media). The sound pressure level is inversely proportional to the square of the distance from the source. The sound pressure level decreases by 6 dB with each doubling of distance from the source due to geometrical attenuation.

For a line source, such as a steady stream of traffic, the sound pressure level decreases by 3 dB with each doubling of distance from the source.

The difference in attenuation is due to the spherical radiation pattern in the first case and the cylindrical front in the later instance.

Absorption of Air

For distances of less than 100 meters, noise attenuation by absorption in the air is generally unimportant. It can be an important consideration in aircraft noise abatement, however. The attenuation increases with relative humidity but additional factors such as fog, snow or rain do not have any additional significant effect. Higher frequencies are attenuated much more strongly than lower frequencies. With relative humidity of 60%, high frequency noise ("white noise") is absorbed at the rate of 3 dB per 100 meters. A good example of this absorption of high frequency noises is thunder; if the lightning sources is close, the resultant thunder is a resounding crack; through air absorption distant thunder is reduced to a low frequency as the high frequency content has been attenuated.

Barriers

When a sufficiently solid barrier is placed between a noise source and receiver, the sound reaches the receiver only by diffraction around the barrier. The specific amount of noise reduction is dependent on a number of factors: nature of the source (point, line), relative location of source and receiver, and frequency of the sound. A reduction of approximately 25 dB is obtained for high frequency noise when both receiver and source are reasonably close to the barrier. This reduction decreases if the frequency is reduced or when the source or receiver is moved further apart.

This concept may be applied when faced with a traffic-residential noise interface. Measurements have indicated that a reduction in highway noise of 10 dB to 15 dB may be achieved by the use of barriers or buildings. The number of rows of additional buildings have not shown to significantly reduce the noise further; the first row serves as the barrier and subsequent rows do not have a significant effect.

Transmission Loss

The sound-insulating capability of a wall is described by its transmission loss (TL) capacity. TL denotes the drop in sound pressure level from the source side to the receiver side of the wall. Sound insulation is greater at higher frequencies and progressively poorer as lower frequencies are encountered.

Where the wall contains a window, vent, door or other opening, the insulating capacity of the wall is lowered, and similarly, the TL is decreased. The following chart shows TL variations based on several circumstances:

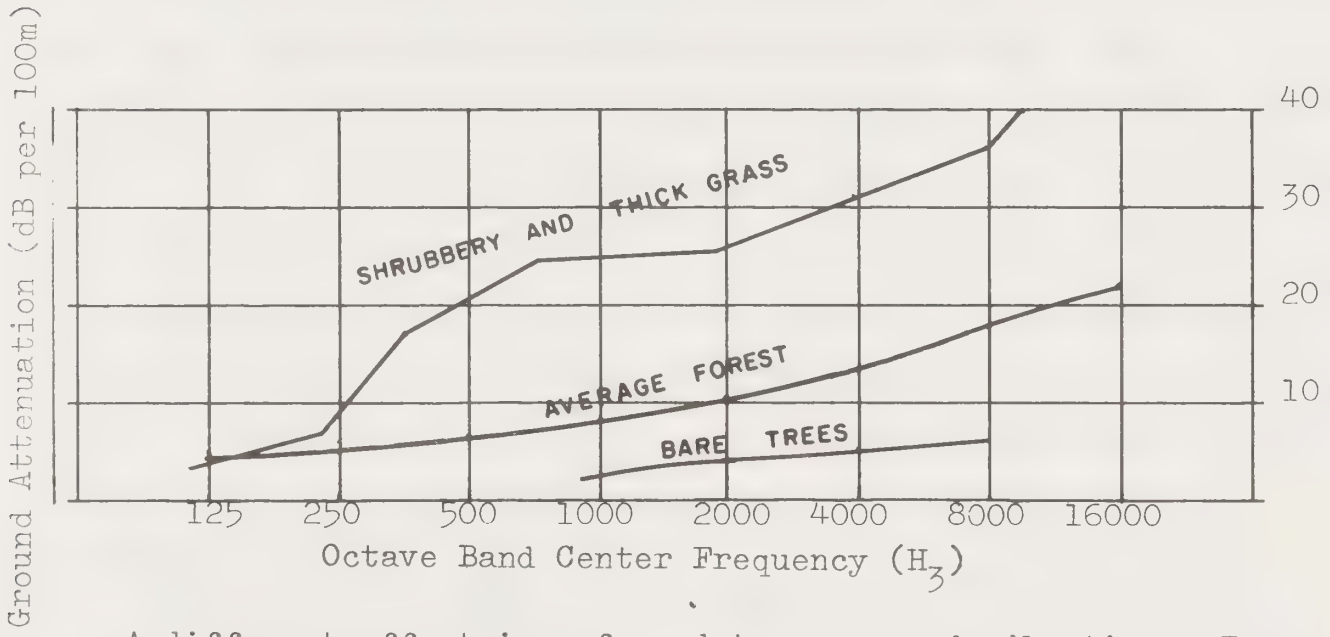
Reduction of TL due to Windows

Type of Structure	Windows Open	Windows Closed (single pane)	Windows Closed (double pane)
Light Frame	10 dB	20 dB	30 dB
Masonry	10 dB	25 dB	35 dB

It is interesting to note that the presence of any gap reduces any Transmission loss level of 15 dB or more down to 10 dB. Even a 1% gap reduces a TL level of 25 dB or more down to 20 dB.

Ground Effects

In addition to geometrical attenuation, outdoor noise also attenuates due to absorption by the ground. Ground absorption depends on the ground covering and on the heights of the source and the receiver. The following curves give a good approximation of the attenuation capacities of various types of ground covers. It is evident that shrubbery provides much greater attenuation capability than do trees.[6]

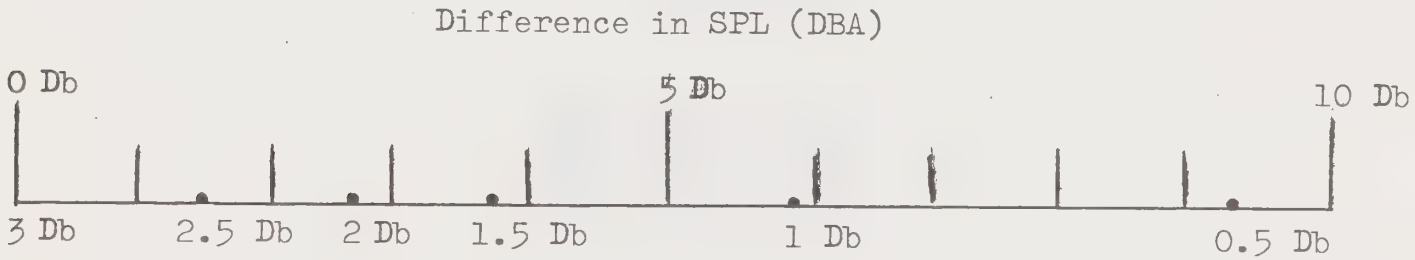


A different effect is referred to as ground vibration. In this ground effect, noise is transmitted through the ground, as from railroad tracks, to nearby structures. Such ground vibrations cause structural vibrations in the building which will then generate noise, usually a low-frequency rumbling.

Combination of Sounds

For various reasons, it may be necessary for one to know how to "add decibels". A person may, for example, wish to compute the total sound due to the combination of sounds from two sources.

By use of a complicated formula which considers sound pressures, the following scale is derived.



DB added to Higher SPL

Note that the combination of two sounds with the same sound pressure level (SPL) or dB level, leads to a total of 3 dB above the level of the single source alone. It should be noted, as well, that a reduction of one of the sounds can result in an overall noise reduction of no more than 3dB. Put another way, if the 2 SPL's differ by more than 10dB, then the level of the quieter sound has no appreciable effect on the total level. The following rule of thumb is generally accepted: if the sound pressure level, when a source is operating, exceeds the ambient level by 10dB or more, then the contribution of the ambient is neglible and the measured sound levels are essentially due to the source.[5]

Besides the few terms and concepts discussed here, acoustical engineers and other practitioners in the filed of noise have developed many, many more descriptive notations. While one may be uncertain but that such a deluge of terminology is meant only to confuse the

uninitiated, further study amply reinforces this uncertainty. In hopes of avoiding unnecessary confusion, this element will utilize only those previously discussed terms in its examination of noise pollution.

CHAPTER III

THE NOISE POLLUTION PROBLEM

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Noise Sources

There are many noise producing culprits, some being far more objectionable than others. The dominant sources for outdoor noise in urban residential areas are motor vehicles, aircraft and people activities. Results from a number of surveys which asked what noise disturbed the respondents in their home are listed below:

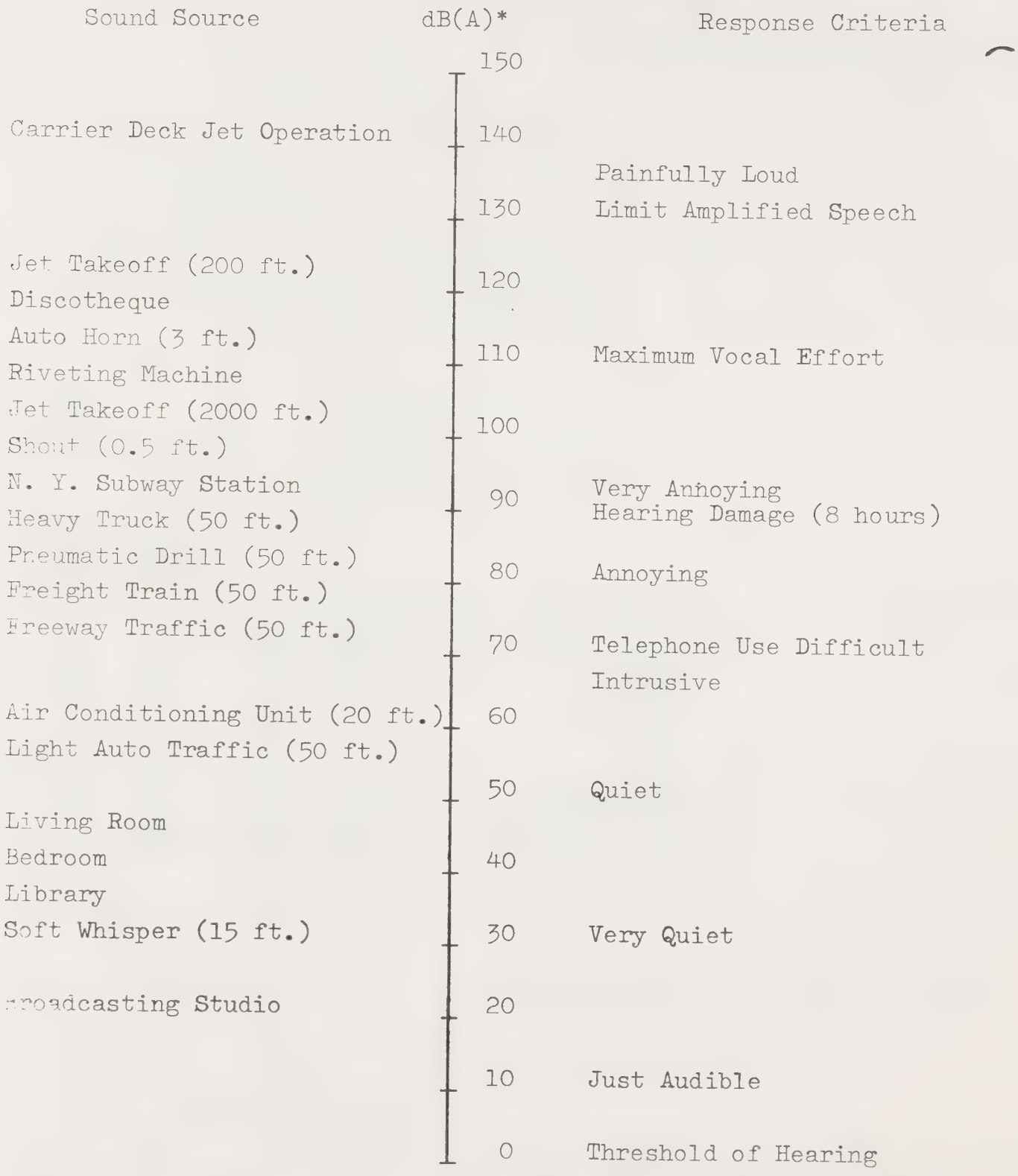
London Survey[1]			Chicago, 1969	Chicago, 1970	Minneapolis/ St. Paul	4 western cities	4 eastern cities
Road Traffic	36%	Autos/Trucks	32%	22%	29%	22%	18%
		Motorcycles/Hot Rods	36%	26%	26%	24%	33%
Aircraft	9%	Aircraft	37%	40%	33%	39%	62%
		Sonic Booms	12%	8%	13%	18%	16%
Trains	5%	Trains	7%	7%	3%	3%	3%
Bells/Alarms	3%	Sirens	8%	6%	15%	14%	17%
Industrial/Construction	7%	Construction	3%	2%	6%	2%	6%
Other People	19%	People Activities	33%	32%	32%	26%	20%
(Children)	(8%)	(Neighbor Children)	(18%)	(13%)	(13%)	(14%)	(9%)
Pets/Animals	3%	Dogs, Other pets	10%	8%	13%	13%	15%
Other or No Response	28%						
Number Surveyed	1,400	Number Surveyed	1064	872	901	3590	3217

1 - Noise final report (Wilson Report) 1963
Origins of external noise which disturb people at home - Percent of people questioned

You will note that these surveys reinforce the eminence of transportation modes and people activities as the more prominent sources of noise annoyance. It is assumed that the results of these studies would approximate the situation in Placer County.

The following table relates the sound levels of various sources to human response. While the table shows a maximum of 150 dBA, it should be noted that 180 dBA is the limit of human endurance, a point at which death occurs.

WEIGHTED SOUND LEVELS AND HUMAN RESPONSE



* Typical A-Weighted sound levels taken with a sound-level meter and expressed as decibels on the scale. The "A" scale approximates the frequency response of the human ear.

Let us now review these major noise producers in more detail.

Transportation Noise Sources

Highways - As with most of California, the largest contributing factor to the noise pollution problem in Placer County is transportation. Diesel trucks and buses, at freeway speed, often exceed 80 dBA at the edge of the freeway right-of-way. While automobiles are not as loud, usually approaching 75 dBA, they add to the noise emanating from the highway. Motorcycles also add to the noise and can, in fact, produce noise exceeding that generated by trucks.

There are many factors which make up freeway noise: the amount and composition of traffic speed limits, faulty exhaust systems, tire whine and wind noise. Several of these components may be manipulated to reduce noise. Lower speed limits have resulted in lower noise generation. Changing pavement composition or tread design can reduce noise generated from that source. Figure 1 illustrates traffic noise levels as a function of distance from the edge of the nearest traffic lane. 5,000 vehicles per hour with an average speed of 60 mph and 5% trucks is assumed. While the figure shows L_1, L_{10} & L_{90}, L_{10} is of primary use in studying freeway wayside noise.

Greater traffic flow or speed will give higher noise levels while, conversely, lower flow rates or speeds would result in lower noise levels. To adjust the L_{10} curve to these variables, the following equations may be used for distances between 30 feet and 200 feet of the near traffic lane:

$\Delta L_{10} = 16 \log_{10} \frac{V}{60}$ for speed correction where

V is the average vehicle speed from 40-70 mph

and $\Delta L_{10} = 8 \log_{10} \frac{Q}{5000}$ for flow rate correction where

Q is the traffic flow in vph.

These relations are equivalent to a change of 4.8 dBA per doubling of speed and 2.4 dBA per doubling of flow.

For different percentages of heavy vehicles, the approximate corrections to L_{10} are:

Percentage of trucks	ΔL_{10}
0	-1 dBA
5	0
10	+1
20	+2

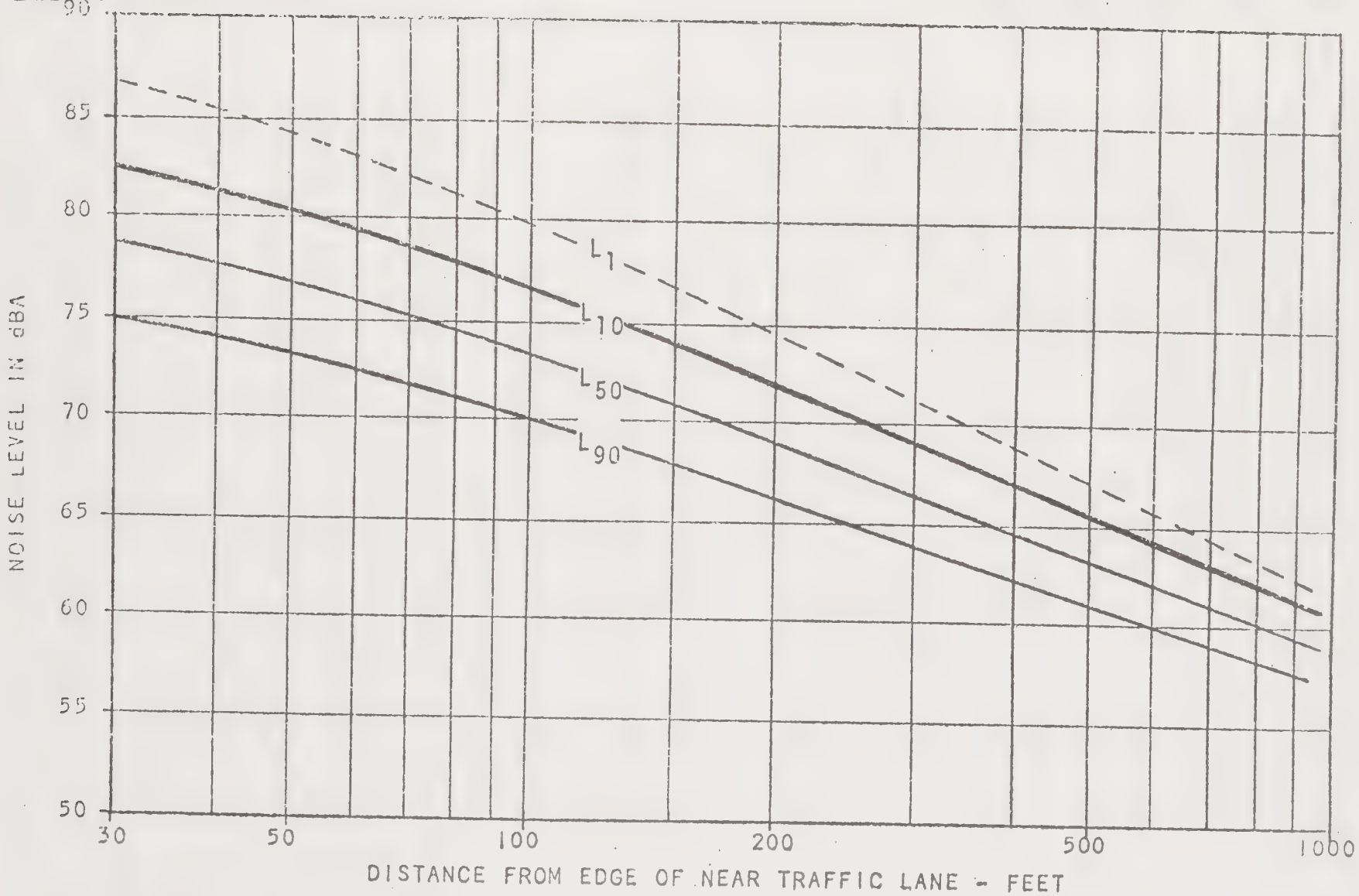


FIGURE I NOISE LEVELS FOR FREELY FLOWING TRAFFIC ON A MULTILANE DIVIDED HIGHWAY AS A FUNCTION OF DISTANCE FROM THE EDGE OF THE NEAREST TRAFFIC LANE FOR OPEN LEVEL TERRAIN [19]

5000 VPH - 60 MPH AVERAGE SPEED - 5% TRUCKS

(NOTE: L_{EQ} falls between L_{10} and L_5)

Railroads - Noise generated from trains emanates from 2 sources: that produced by the engine and that caused by the interaction of the wheel and rail. Generally, noise produced by trains are as loud as the noise produced by a diesel truck at freeway speed. There is, of course, a great difference between the two in terms of duration and frequency of occurrence.

As with other noises, train noises are subject to many variables. The speed of the train, whether the track is upgrade or downgrade or level and the condition of the track itself all may have a significant effect on the overall noise generated. It should be noted that the frequency of noise generated by trains is usually in the lower frequencies which is normally more acceptable to the human ear.

Airports - Citizens residing in the vicinity of airports are exposed to the noise of aircraft operations. There have been numerous instances where such citizens have, either individually, or in groups, complained to various authorities of airport noise disturbances. Studies have shown that there is a correlation between noise complaints and the following factors:

1. intensity and duration of the noise from aircraft operations;
2. number of aircraft operations; and
3. time of occurrence during the day (daytime, evening or night)

There are many reasons given by residents for their complaints; ... most often cited, however, are interference with speech communication, television, and sleep.

Title 4, Subchapter 6 of the California Business Regulations establishes a level of noise acceptable to a reasonable person residing the vicinity of an airport. The level proposed is 65 dBA (CNEL)

for new airports. Giving consideration to economic and technical feasibility, the CNEL for existing civilian airports is 70 dBA until December 31, 1985 and 65 dBA thereafter.[4]

Fixed Sources

Fixed noise sources, as the name implies, are those noise sources which produce sound from a permanent or semi-permanent point. Two fixed sources are most often considered: industrial sources and construction sources. Industrial noise has been subject to greater regulation than other noise for several reasons. First, control of industrial noise is usually easier. Methods of attenuating machine noise have been developed for most problem areas. The culprit of noise in an industrial situation is also more easily isolated and dealt with on a one-to-one basis, as compared with vehicular noise control which must deal with great numbers of sources. Secondly, it is mostly in industrial situations where hearing loss and other noise aided ailments are found. Industrial accidents, too, have been correlated to exposure to industrial noise.

In response to labor complaints and management concern, industry is making efforts to reduce the detrimental impact of noise. Separation of noisy machines and workers, noise abatement equipment on machinery and total redesign where necessary are a few of the steps taken.

With State and Federal requirements, management awareness and personnel cooperation, noise hazards in industry should continue to decline.

The problem of noise control in construction provides a more cult problem. Piledrivers, air compressors, riveting machines and all the other motor-driven components of construction produce

potentially harmful levels of noise. At best, such equipment is most obnoxious and annoying to the public. At worst, it can interfere with communications and other social activities or damage hearing ability. Steps have been taken, as with industrial situations, to reduce the noise escaping to the environment. Heavy duty muffler systems and sound insulation techniques are being used. Hours of operation have been instigated to mitigate some complaints.

Construction noise will likely be a high producer of noise in the future. While a person's exposure to construction noise does not extend over long periods of time, technology should continue to search for ways to make that short encounter less annoying.[14]

The following diagrams illustrate the typical noise levels which various classes of individuals absorb daily.[20]

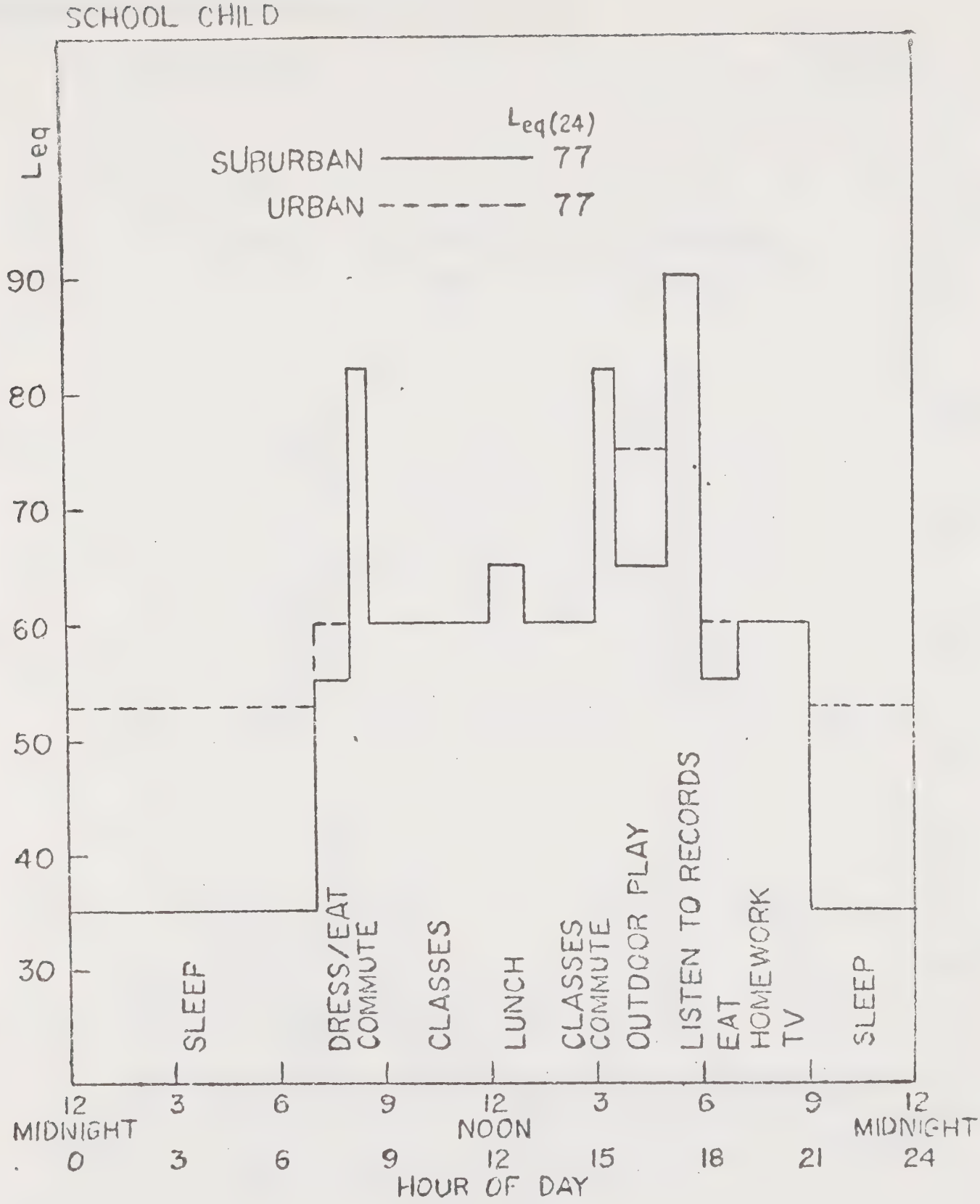


Figure Typical Noise Exposure Pattern of a School Child

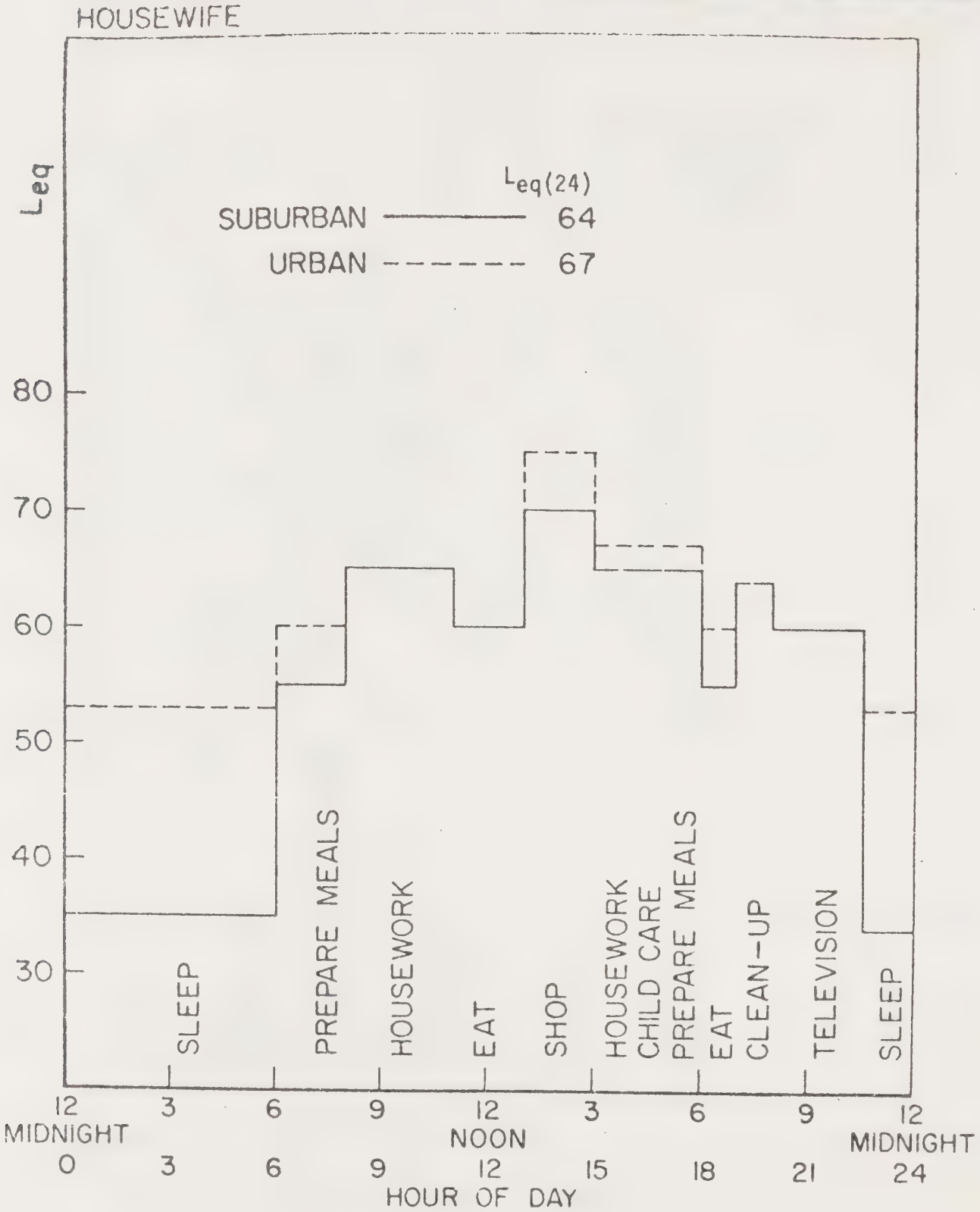


Figure Typical Noise Exposure Pattern of a Housewife

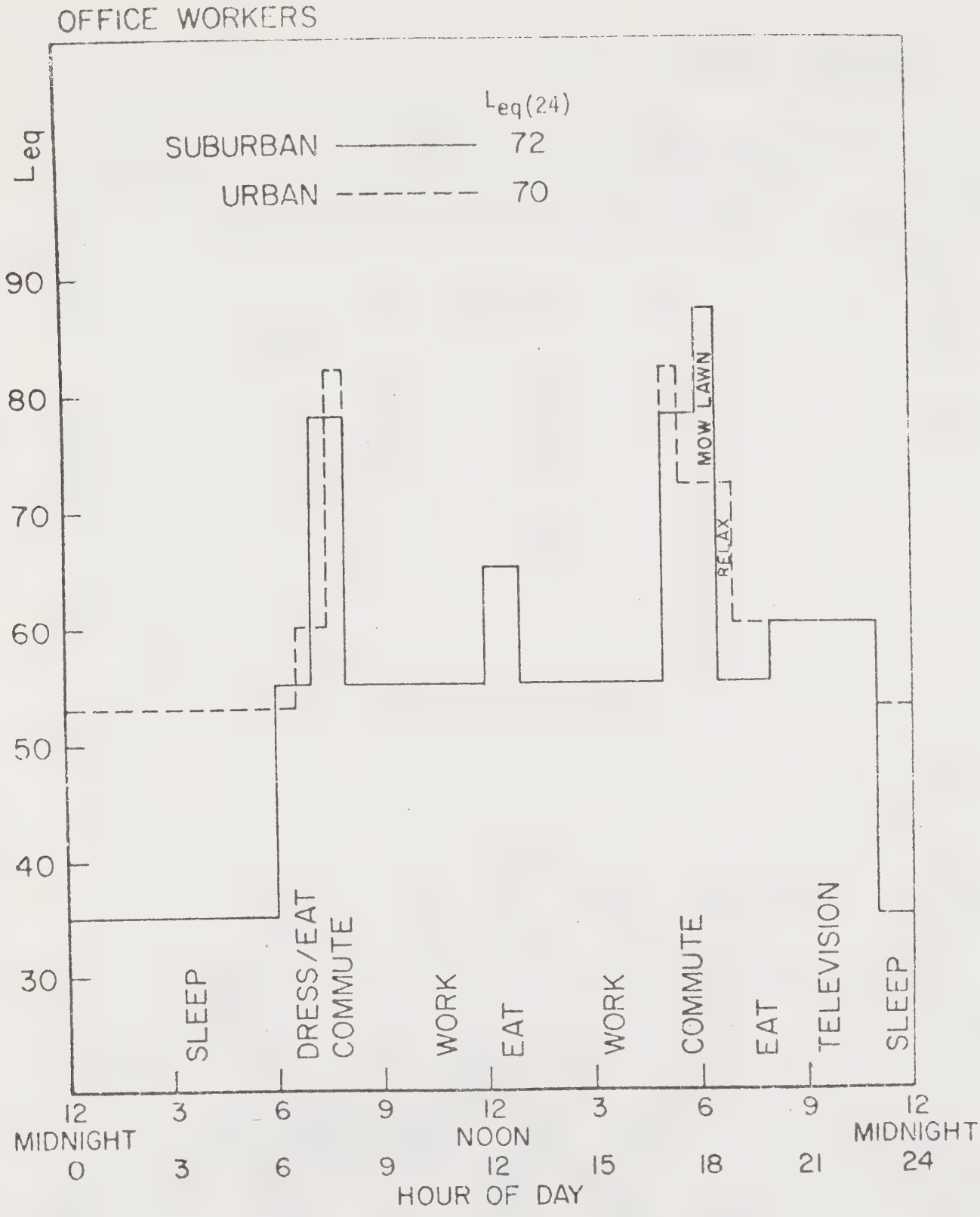


Figure Typical Noise Exposure Pattern of an Office Worker

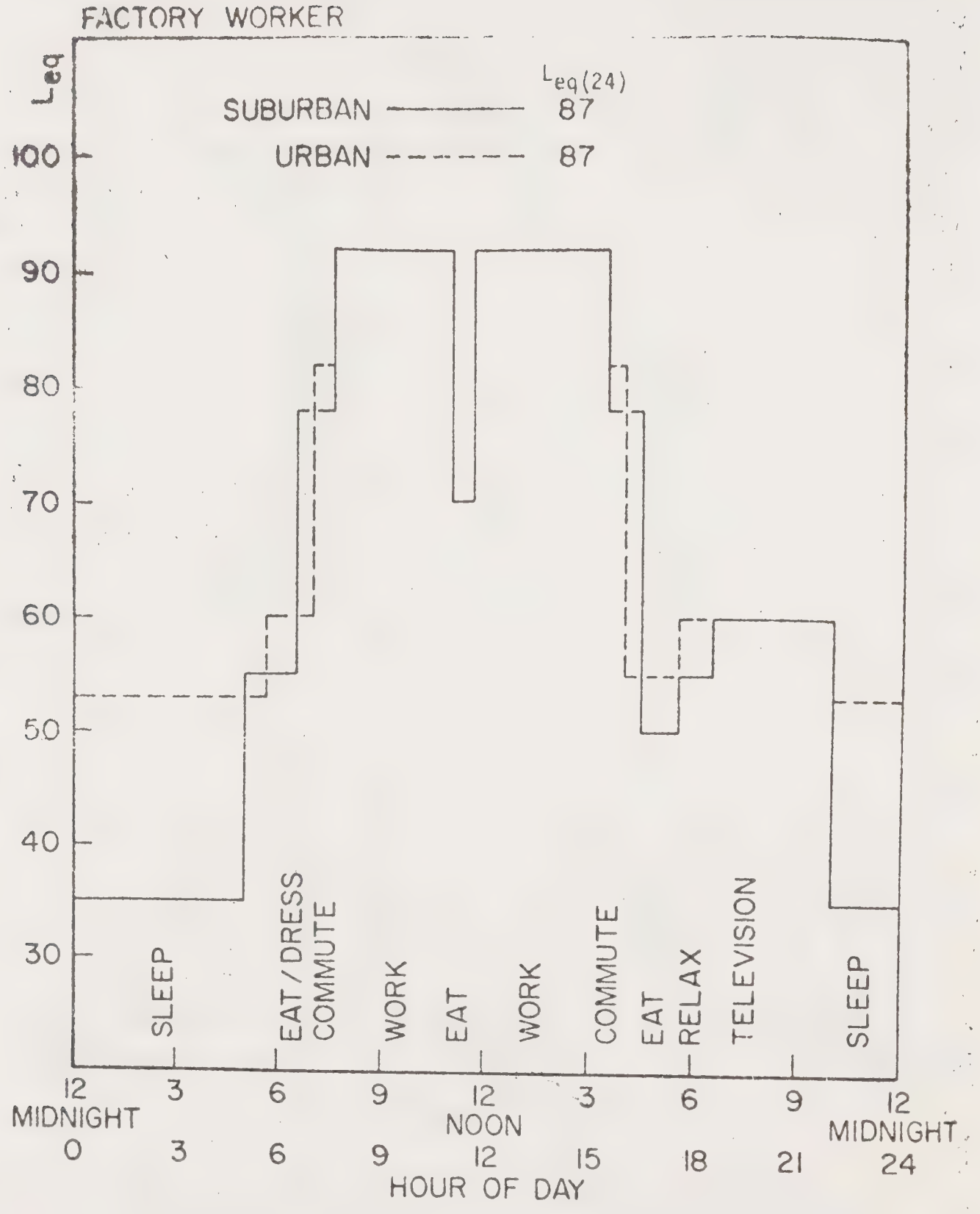


Figure Typical Noise Exposure Pattern of a Factory Worker

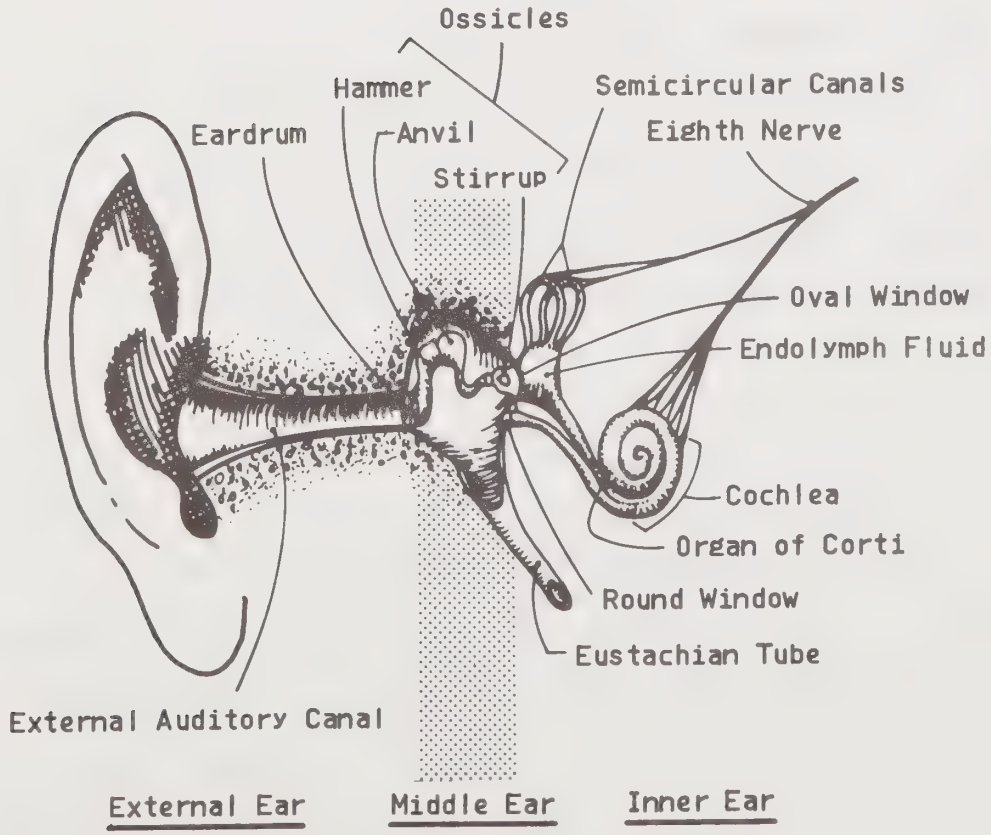
The Effects of Noise

When one thinks of the detrimental effects of prolonged noise, it is most often in terms of physical damage. There is, however, growing concern for the psychological, social, and economic impacts of excessive noise.

Physical Effects

The most obvious affect of intense sound is damage to hearing. When intense sound waves occur only briefly, the damage may be temporary. If these loud noises are frequent or sustained, the damage may be permanent, unrestorable through either surgery or hearing aids. Such hearing loss is actually a result of damage to microscopic hair cells located within the inner ear.

DIAGRAM OF HUMAN EAR



Permanent hearing loss occurs only in certain frequencies because different hair cells respond differently to various frequencies. The hair cells that seem to be the most susceptible to damage are those that respond to the high frequencies.

As we grow older, it is common for our hearing capacity to decline. Studies have been done which indicate that this is not a condition experienced in all cultures; rather, it is a function of the noise level within which the person exists.

Learning too can be adversely affected by excessive noise [illegible] consultant hearing deficiencies. Recent studies of young school children thought to be "slow learners" revealed that at least some of the students could not hear everything that was being said in the classroom. Similar undetected hearing difficulties could be the cause of performance impairment among adults.

Excessive exposure to noise may also result in stress which may lead to general health problems and loss of sleep. At levels of 85 decibels and above, stress reactions can be expected. Ulcers, indigestion, heartburn, gastro-intestimal malfunctions and heart disease are all connected to stress in general. Noise may be a contributing factor in the rate of occurrence of these disease conditions.

While hearing loss due to exposure to excessive noise is documented, other physical effects (i.e., fatigue, increased blood pressure, anxiety) are not well documented. So as not to accept undocumented assumptions while still accepting their potential association with noise, the general guideline "protect hearing and you protect against any other effects on physical health" is

supported by this document.

Psychological Effects

Stress also is a factor in mental illness. It develops when individuals are overwhelmed by the stresses of life and, as a defense, mentally retreat to escape. While noise alone does not cause mental illness, the bombardment of noise on an already depressed person may well compound the problem. Certainly it interferes with sleep, producing irritability and other tensions.

Recent medical studies have also indicated that extreme noise can affect unborn babies. Previously, they were thought to be insulated from external noise, but physicians now believe that external noises can and do trigger changes in fetuses.

Social Effects

Physical and psychological effects produced or aggrevated by extreme noise may also manifest themselves in social interaction. People exposed to excessive noise may, for example, become agressive in their actions towards other persons, a problem closely related to "Psychological effects" above. "Physical effects" may, as well, cause social problems through such factors as hearing deterioration or stress. Conversation, a social action, may also be easily hampered by noise.

TABLE
ACTIVITY SENSITIVITY ANALYSIS

ACTIVITY SENSITIVITY FACTORS

H = High
M = Medium
L = Low
V = Varies

HUMAN ACTIVITIES

HUMAN ACTIVITIES	NOISE SENSITIVITY FACTORS					LAND-USE DEPENDENT SENSITIVITY FACTORS							
	Maximum allowable steady-state noise level (dBA)	Self-noise important to noise sensitivity	Associated normal information-carrying sound level (dBA)	Importance of speech or other information-carrying sound	Frequency of speech communication or other sound information	Schedule of activity (day, night)	Duration of activity	Frequency of activity	Suitability of amplification	Possibility of rescheduling	Possibility of relocating activity	Suitability of structural insulation	Importance of values
Intensive Conversation	40	No	60	H	H	D,N	M	M	M	M	M	H	M
Casual Conversation	50	No	60	M	M	D,N	L	H	L	H	M	H	M
Telephone Use	45	No	60	H	H	D,N	L	L	M	M	M	H	M
Sleeping	35	No	V	L	L	N	H	M	L	L	M	H	M
Eating	45	No	60	M	M	D,N	M	M	L	L	M	H	M
Reading	40	No	V	L	L	D,N	M	M	L	M	M	H	M
Meditation	40	No	V	L	L	D,N	M	M	L	M	M	H	M
Writing	40	No	V	L	L	D,N	M-H	M	L	M	M	H	M
Studying	40	No	V	L	L	D,N	M-H	M	L	M	M	H	M
Seminar, Group Discussion	40	No	60	H	H	D	M	M	M	L	M	H	M
Classroom, Lecture	40	No	60	H	H	D	M	M	M	L	M	H	M
Individual Creative Activity	40	No	V	L	L	D,N	M-H	M	L	M	M	M	H
Live Theater	35	No	60	H	H	D,N	M	L	L	L	L	H	M
Watching Films	40	No	60	H	H	D,N	M	L	M	L	L	H	M
Watching Television	40	No	60	H	H	D,N	M	M	M	M	M	H	M
Listening to Music	35	No	V	L	L	D,N	M	L	M	M	M	H	M

FIGURE (CONT)
ACTIVITY SENSITIVITY ANALYSIS 13

HUMAN ACTIVITIES / ACTIVITY SENSITIVITY FACTORS (H = High, M = Medium, L = Low, V = Varies)	BASIC SENSITIVITY FACTORS					LAND-USE DEPENDENT SENSITIVITY FACTORS							
	Maximum allowable steady-state noise level (dBA)	Self-noise important to noise sensitivity	Associated normal information-carrying sound level (dBA)	Importance of speech or other information-carrying sound	Frequency of speech communication or other sound information	Schedule of activity (day, night)	Duration of activity	Frequency of activity	Suitability of amplification	Possibility of rescheduling	Possibility of relocating activity	Suitability of structural insulation	Importance of values
Ceremony, Tradition	40	No	V	H	H	D,N	M	L	L	L	L	M	H
Public Events, Assemblies	45	No	60	H	H	D,N	M	L	M	L	L	M	L
Spectator Sports	50	No	V	L	M	D,N	M	L	M	L	L	L	L
Public Mass Recreation	55	No	V	M	M	D,N	M-H	L	L	L	L	L	L
Physical Recreation	45	No	V	M	M	D,N	M	M	L	M	M	L	L
Outdoor Activities	35	No	V	M	L	D,N	M-H	L	L	L	M	L	H
Urban Outdoor Activities	45	No	V	M	M	D,N	M	M	L	M	M	L	M
Extended Child Care	40	No	60	H	M	D,N	M-H	H	L	L	M	M	M
Driving	65	Yes	V	L	L	D,N	M	M	L	L	L	L	L
Shopping	45	No	60	M	M	D	M	M	L	M	M	M	L
Technical Manual Work	35	No	V	H	M	D	M-H	M	L	L	M	H	L
Skilled Manual Work	40	Yes	V	M	M	D	M-H	M	L	L	M	H	L
Manual Work	50	Yes	V	M	M	D	M-H	M	L	L	M	H	L
Equipment Operation	V	Yes	V	L	L	D	M-H	M	L	L	L	H	L
Repetitive Work	50	Yes	60	M	M	D	M-H	M	L	L	M	H	L
Noise-Sensitive Equipment	V	Yes	V	V	V	D,N	M-H	L	V	V	V	H	L

For ease in conversation, over 90% of the words spoken should be correctly heard. Studies have shown that 71 dBA is the maximum acceptable level for background noise so that it does not interfere with conversation. Above this background noise level, complaints are received and people feel that they do their jobs less efficiently.

More annoying than noise's interference with conversation is its interference with sleep. In a study of over 300 subjects, it was found that noise stimulus equivalent to 60 dB awoke all but 10% of the subjects. Other studies have found levels not in excess of 35 dBA, measured inside the dwelling, are required to assure undisturbed sleep. [12]

Economic Effects

Continuous noise levels above 90 dBA appear to have potentially detrimental effects upon human performance, especially when tasks involving exacting or predominantly mental work. The amount of disruption is highly dependent on: 1) the type of task; 2) the characteristics of the recipient; and 3) the level of morale and motivation of the worker.

The effects of noise on routine-type tasks appear to be much less important although some cumulative degrading effects have been shown. In both cases, excessive noise can produce agressiveness, nervousness and irritability among workers. Noise, therefore, can be of serious consequence to productivity.

Noise also has an economic impact as it pertains to land use. Land located near airports, railroad tracks or freeways may be poorly suited for many uses because of noise problems.

To summarize, the Environmental Protection Agency has identified certain levels of noise as a requisite to protect public health and welfare with an adequate margin of safety. The following table indicates that exposure to 70 dBA over a 24-hour period could result in some hearing loss. It should be noted that other sources have variously placed this level at 75 to 80 dB. It should also be understood that a 70 dB exposure for 24 hours equals a 73 dB exposure for 12 hours which equals a 76 dB exposure for 6 hours and so forth.

LEVEL	AREA	EFFECT
$L_{eq}(24)$ - 70 dB	all areas	Hearing loss
L_{dn} - 55 dB	Outdoors in residential areas, farms and other outdoor areas where people spend widely varying amounts of time; other places in which quiet is a basis for use	Outdoor activity interference and annoyance.
$L_{eq}(24)$ - 55 dB	Outdoor areas where people spend limited amounts of time (i.e., school yards, playgrounds).	
L_{dn} - 45 dB	Indoor residential areas.	Indoor activity interference and annoyance.
$L_{eq}(24)$ - 45 dB	Other indoor areas with human activities (ex. schools and churches).	

CHAPTER IV

NOISE POLLUTION

IN PLACER COUNTY.

CHAPTER IV

NOISE POLLUTION IN PLACER COUNTY

In terms of the impact of noise, Placer County is most fortunate when compared with other regions of the state. Much of the County's area is devoted to rural and agricultural land uses presently impacted little by excessive or unwanted noise. There are, however, areas in the County where noise is, or possesses the potential to become, a threat to the quality of life. It would be a mistake to ignore these potential problems and to assume that all will be acceptable in the future. Legislation contained in the Government Code requires that noise contours of present and projected noise levels be shown for all highways and freeways and airport facilities. The following maps indicate such contours. Inspection of these illustrations indicate potential areas of concern. Other concerns, expressed in general terms, and abatement measures will be discussed subsequently.

There are seven state highways which carry travelers through Placer County. Noise contour maps are to be included for representative areas of each of these highways.

Also following are noise contours for the most heavily traveled County roads and for the two public airports located within the county's jurisdiction: one is located near Truckee, the second is located at Blue Canyon. Noise contours for the Auburn Airport are also included herein. Even though this airport is totally within the city limits of Auburn, it is an island annexation being surrounded by unincorporated areas.

Airports

Tahoe-Truckee Airport, Martis Valley

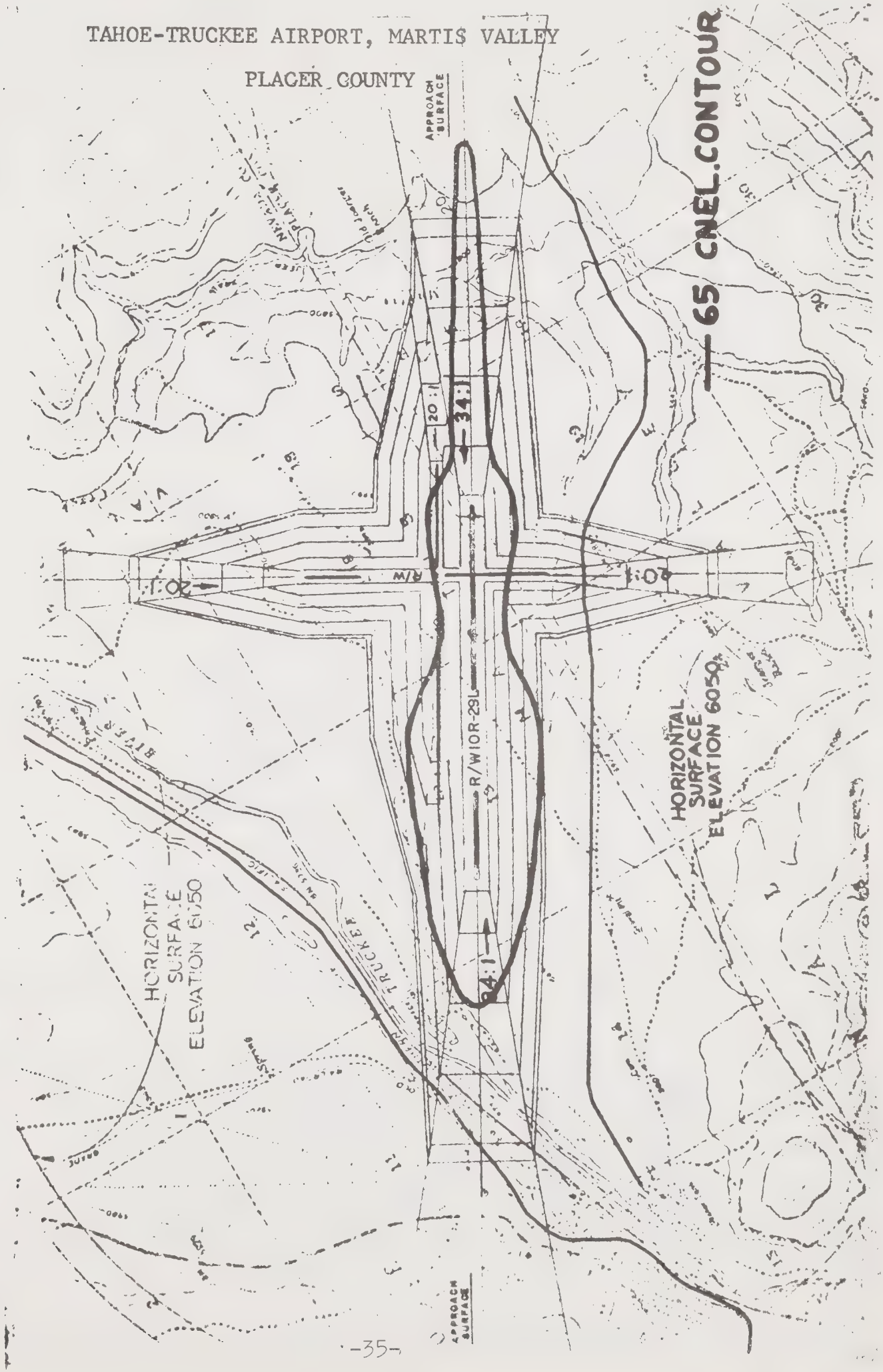
The existing noise levels resulting from the Tahoe-Truckee Airport have been measured and are shown graphically on the following page. The 65 dBA Community Noise Equivalent Level (CNEL) is based upon an assumed level of aircraft operations at the airport.

The noise impact boundary is established based upon eight commercial jets (DC-9, Boeing 737 type), eight business jets, one turbo fan jet, and 152 propeller-type aircraft operations in one day (one operation is either a take-off or a landing). Subsequent to the computation, the district has been approached by an air carrier that has applied through the Civil Aeronautics Board to provide air service to the Tahoe-Truckee Airport, effective May 1, 1974. The carrier plans to utilize Lockheed Electra turbo props, at a frequency of 12 operations a day during peak periods. The California Division of Aeronautics has been contacted to ascertain the effect of this frequency and type of aircraft as relates to the noise boundary. The C.D.A. is of the opinion that there will be a very marginal increase relative to the noise impact.

The airport noise has drawn a small number of complaints from homeowners located at the north end of the main runway. A subdivision exists in this area and the homes are subjected to a certain amount of intensive noise from aircraft using the airport. In the future, conflicts in land use resulting in these problems should be avoided. (Source: Martis Valley General Plan)

TAHOE-TRUCKEE AIRPORT, MARTIS VALLEY

PLACER COUNTY

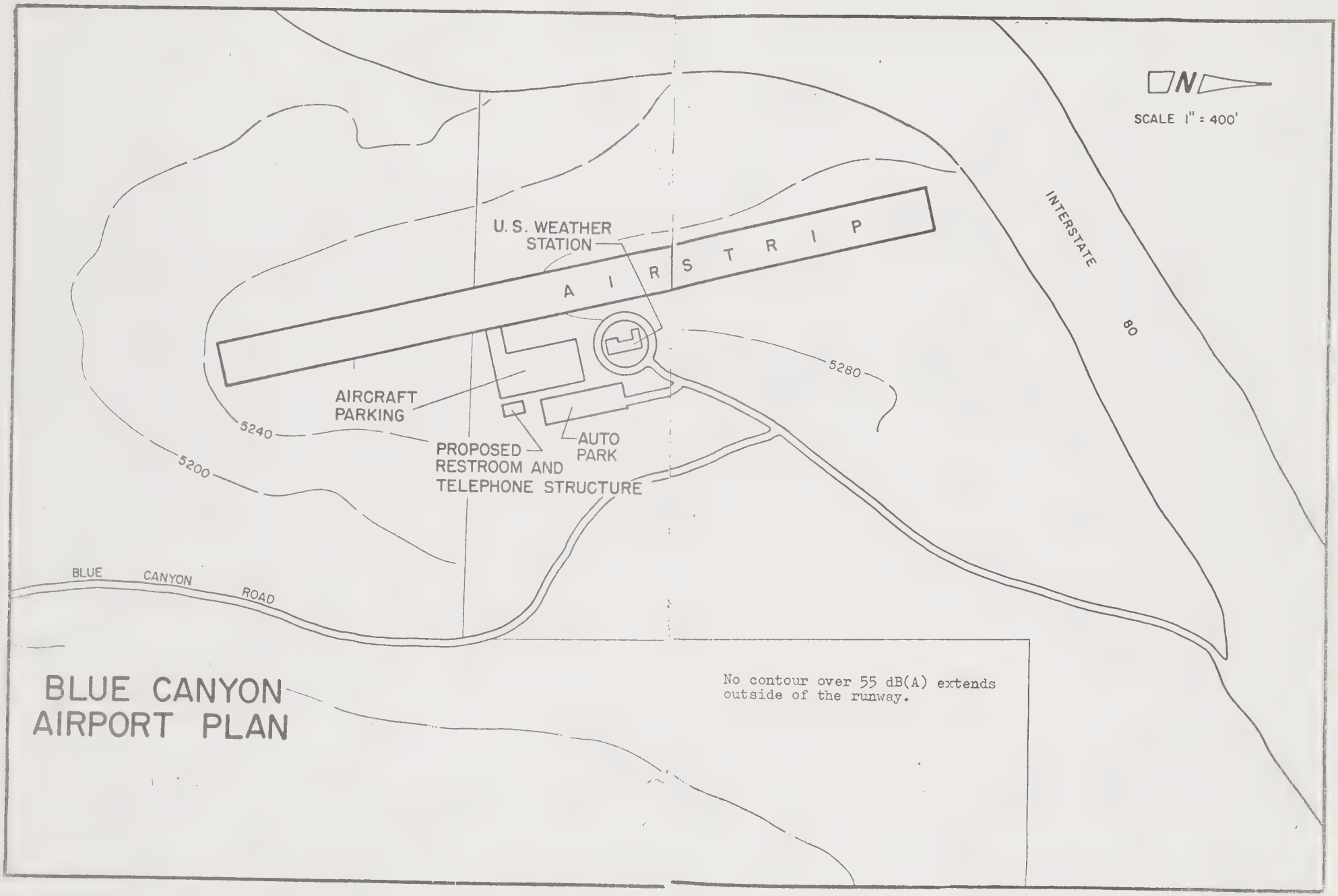


Blue Canyon Airport

The Blue Canyon Airport was constructed as an emergency landing facility for U.S. Mail Service aircraft in 1928. In 1968 and 1969, the State reconstructed the facility to accommodate the airport's new function as an emergency landing field for general aviation aircraft. Other than in emergency situations, the airport generally serves a 20-mile extent of the Interstate 80 freeway corridor from Gold Run to Cisco Grove.

The Blue Canyon Airport Master Plan prepared for Placer County in 1967 estimates the annual general aviation operations at the Airport to be 1000 per year or 2.74 operations per day. The number of future operations at the airport will be greatly influenced by two factors: (1) the expansion of general aviation activity in California and (2) ultimate development of the area. The number of general aviation aircraft in California is expected to nearly double by the year 1985. Considering this increase with an anticipated increase in second home and rural residential development, it can be expected that the number of operations for the airport increase up to threefold. While this is proportionally a great increase, it would amount to something less than 10 operations per day.

In discussions with the California Department of Aeronautics, it was determined that under both present and future operations activity, the 55 dBA contour would fall on or within the runway boundaries. The following plan shows the Blue Canyon facility with an indication that no contour over 55 dBA would fall outside the runway.



BLUE CANYON AIRPORT PLAN

No contour over 55 dB(A) extends outside of the runway.

Auburn Municipal Airport

The Auburn Airport, while located within the city limits of Auburn, is shown so as to inspect its noise impact on the unincorporated areas adjacent. The noise contour map is from the Auburn Noise Element and indicates the 65 dB CNEL contour. The contour is based on the maximum operation capacity of the airport assuming a composition of 90% light twin-engine piston and single-engine piston and 10% executive jet and transport-type twin-engine piston aircraft.

The 65 dB contour occurs at some 200 feet of the edge of the runway. The highest noise would be produced at the start of the take-off roll, possible reaching 70 dB.

With use of the North-South strip not allowed, the 65 dB contour does not extend beyond the city limits. Should the North-South runway be opened to development at its southern end, such development should be kept sufficiently distant to avoid conflicts.

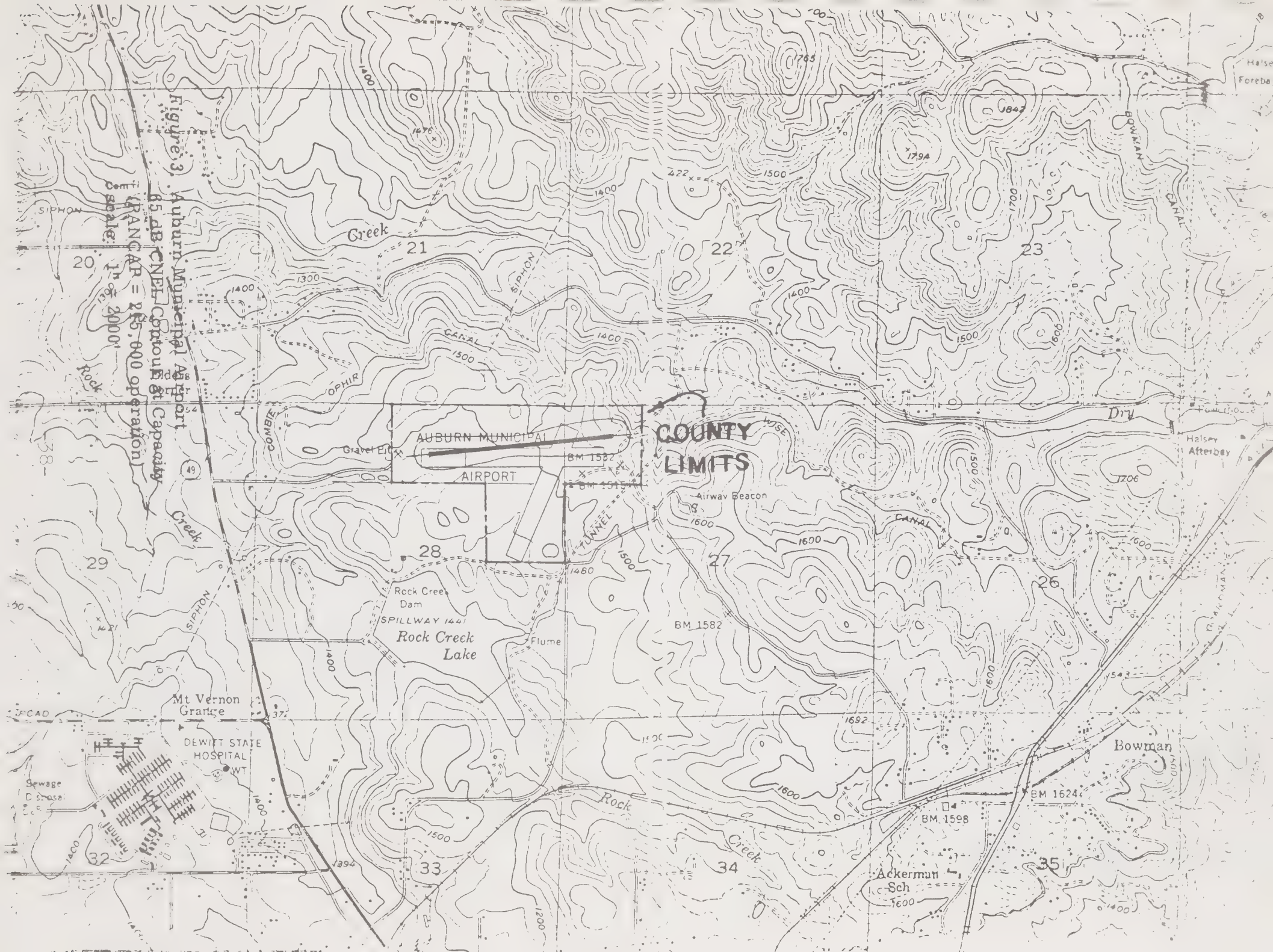


Figure 3. Auburn Municipal Airport
65 dB CNEL Contour at Capacity
(RANCAR = 265,000 operations)
1" = 2000'
Scale:

State Highways

Interstate 80 and Highway 267, Truckee Area

The noise generated by traffic on Highways 80 and 267 has been estimated by the California Department of Transportation. The average distances from Highway 80 to the 65 dB contour was calculated for at grade, 20-foot cut and 20-foot embankment conditions between Truckee and the Nevada State line.

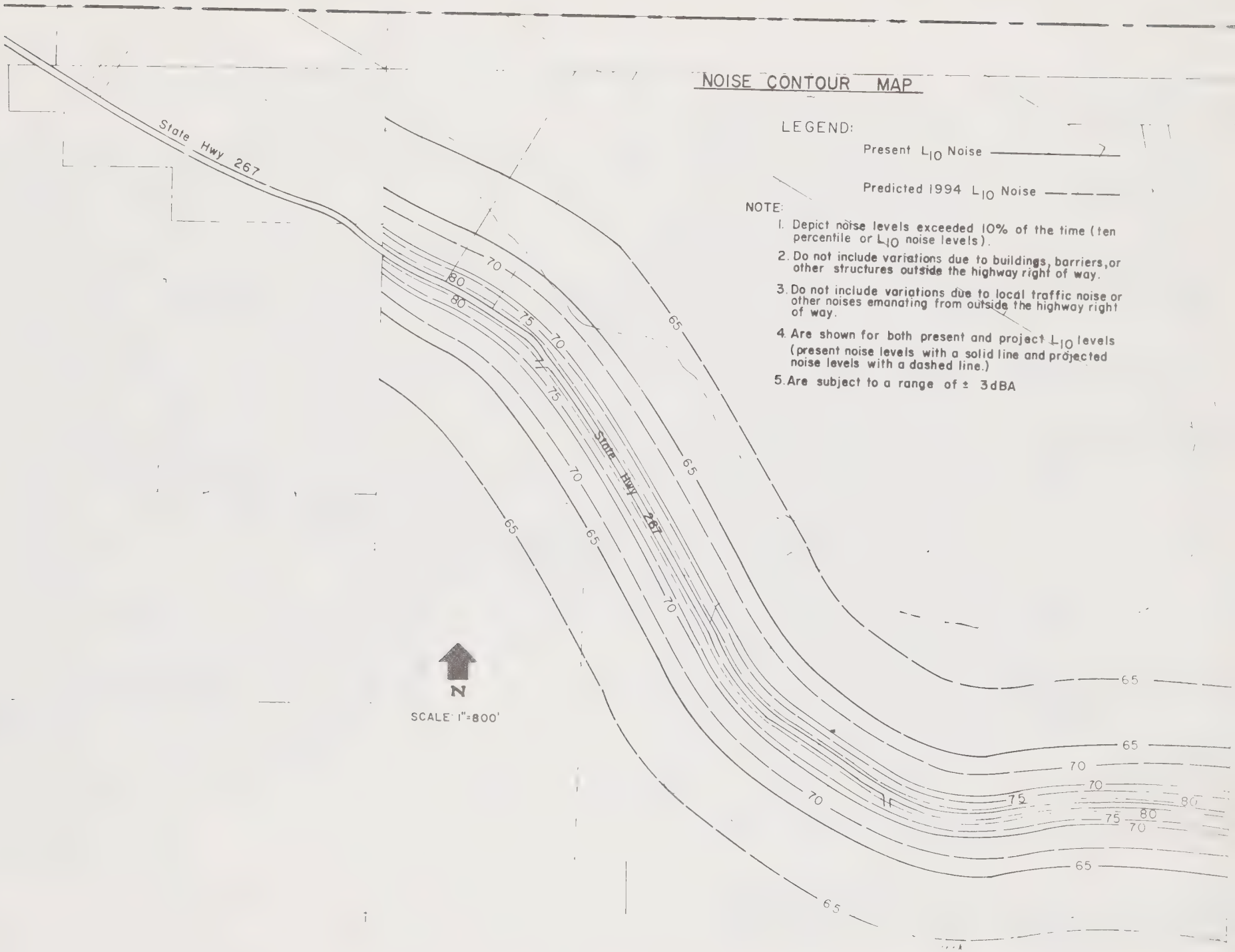
The contours are based on traffic volumes and speed. This method was developed in the National Cooperative Highway Research Program Report 117. The distances to the 65 dB contour is measured from the center of the nearest traffic lane.

YEAR	DISTANCE TO L_{10} 65 dBA CONTOUR		
	At grade	20' cut	20' embankment
1974	280 ft.	65 ft.	20 ft.
1994	400 ft.	75 ft.	55 ft.

Along Highways 267 between Truckee and Kings Beach, the Department of Transportation has completed maps showing the L_{10} noise level for both 65 dBA and 80 dBA for the years 1974 and 1994.

YEAR	DISTANCE TO L_{10} 65 dBA CONTOUR FROM C/L OF HWY.	DISTANCE TO L_{10} 70 dBA CONTOUR FROM C/L OF HWY.
1974	350 ft.	120 ft.
1994	750 ft.	250 ft.

It should be noted that the above projections may require modification for specific cases to take into account grade, curves, and topography outside the highway right-of-way.


NOISE CONTOUR MAP
LEGEND:
Present L_{10} Noise
Predicted 1994 L_{10} Noise
NOTE:
1. Depict noise levels exceeded 10% of the time (ten percentile or L_{10} noise levels).
2. Do not include variations due to buildings, barriers, or other structures outside the highway right of way.
3. Do not include variations due to local traffic noise or other noises emanating from outside the highway right of way.
4. Are shown for both present and project L_{10} levels (present noise levels with a solid line and projected noise levels with a dashed line.)
5. Are subject to a range of ± 3dBA
State Hwy 267
State Hwy 267
65
70
75
80
N
SCALE 1"=800'

Highway 89 and Highway 28 -- Tahoe Basin Area

State Highways 89 and 28 run along and through one of the most scenic and environmentally sensitive areas within Placer County and possibly within the entire state -- the Lake Tahoe Basin. Noise contours for these highways have been plotted by the Department of Transportation and are presented following.

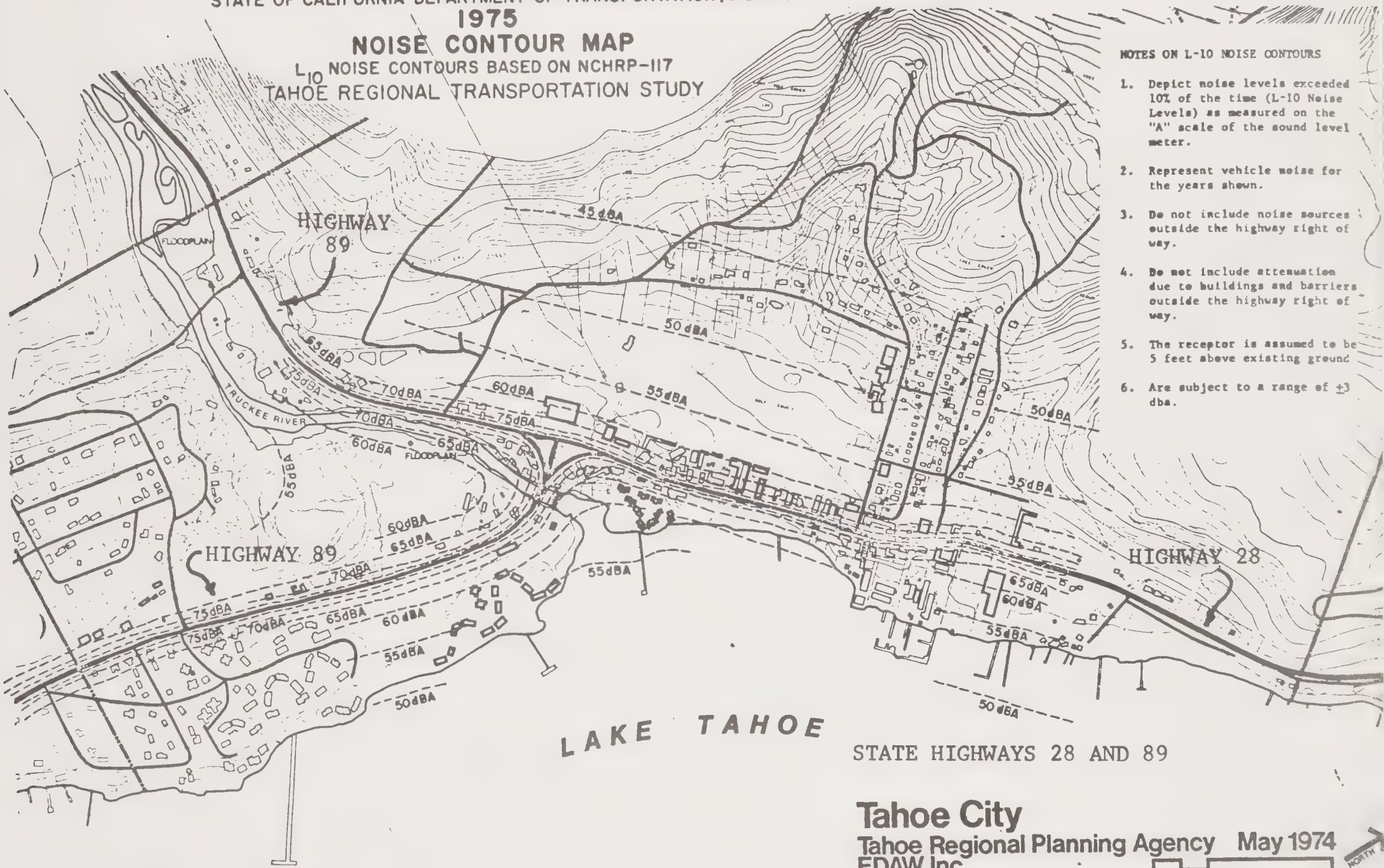
As in other areas near heavily travelled highways, noise abatement techniques should be required as a condition of approval for subdivisions in the Tahoe Basin.

STATE OF CALIFORNIA DEPARTMENT OF TRANSPORTATION, DISTRICT 03

1975
NOISE CONTOUR MAP

L_{10} NOISE CONTOURS BASED ON NCHRP-117

TAHOE REGIONAL TRANSPORTATION STUDY



NOTES ON L-10 NOISE CONTOURS

1. Depict noise levels exceeded 10% of the time (L-10 Noise Levels) as measured on the "A" scale of the sound level meter.
2. Represent vehicle noise for the years shown.
3. Do not include noise sources outside the highway right of way.
4. Do not include attenuation due to buildings and barriers outside the highway right of way.
5. The receptor is assumed to be 5 feet above existing ground
6. Are subject to a range of ±3 dba.

STATE HIGHWAYS 28 AND 89

Tahoe City

Tahoe Regional Planning Agency May 1974

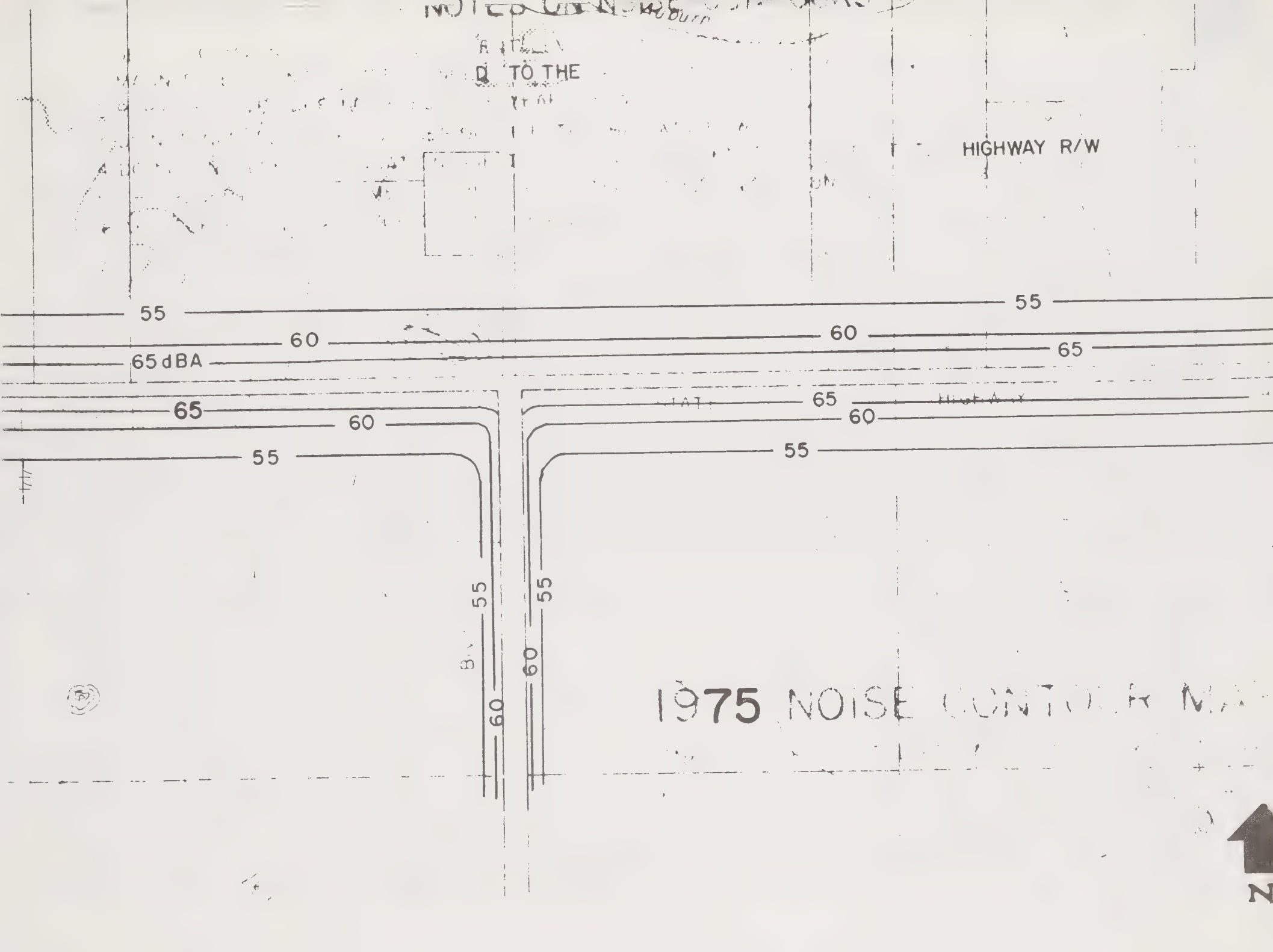
EDAW Inc.

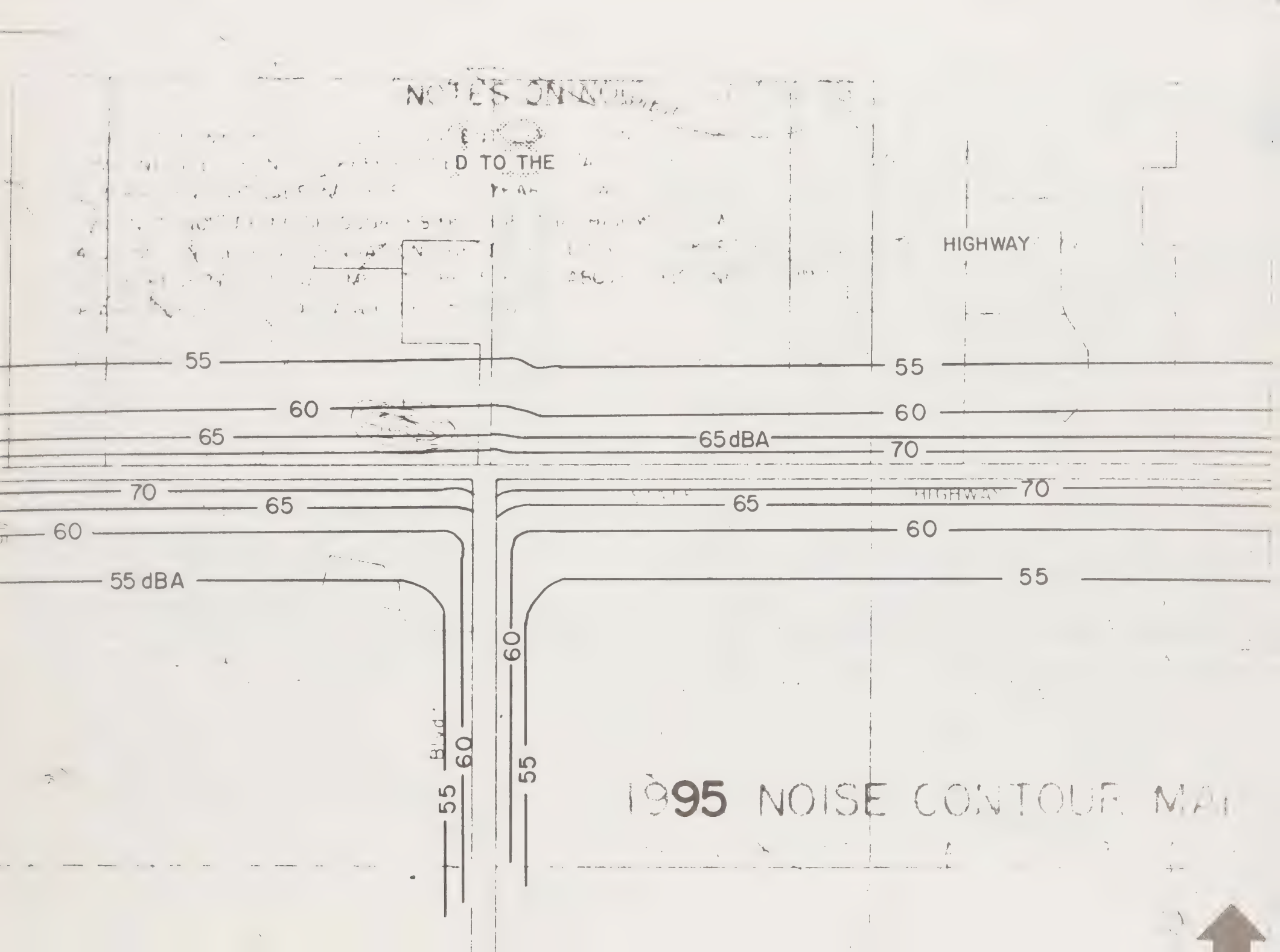
NORTH

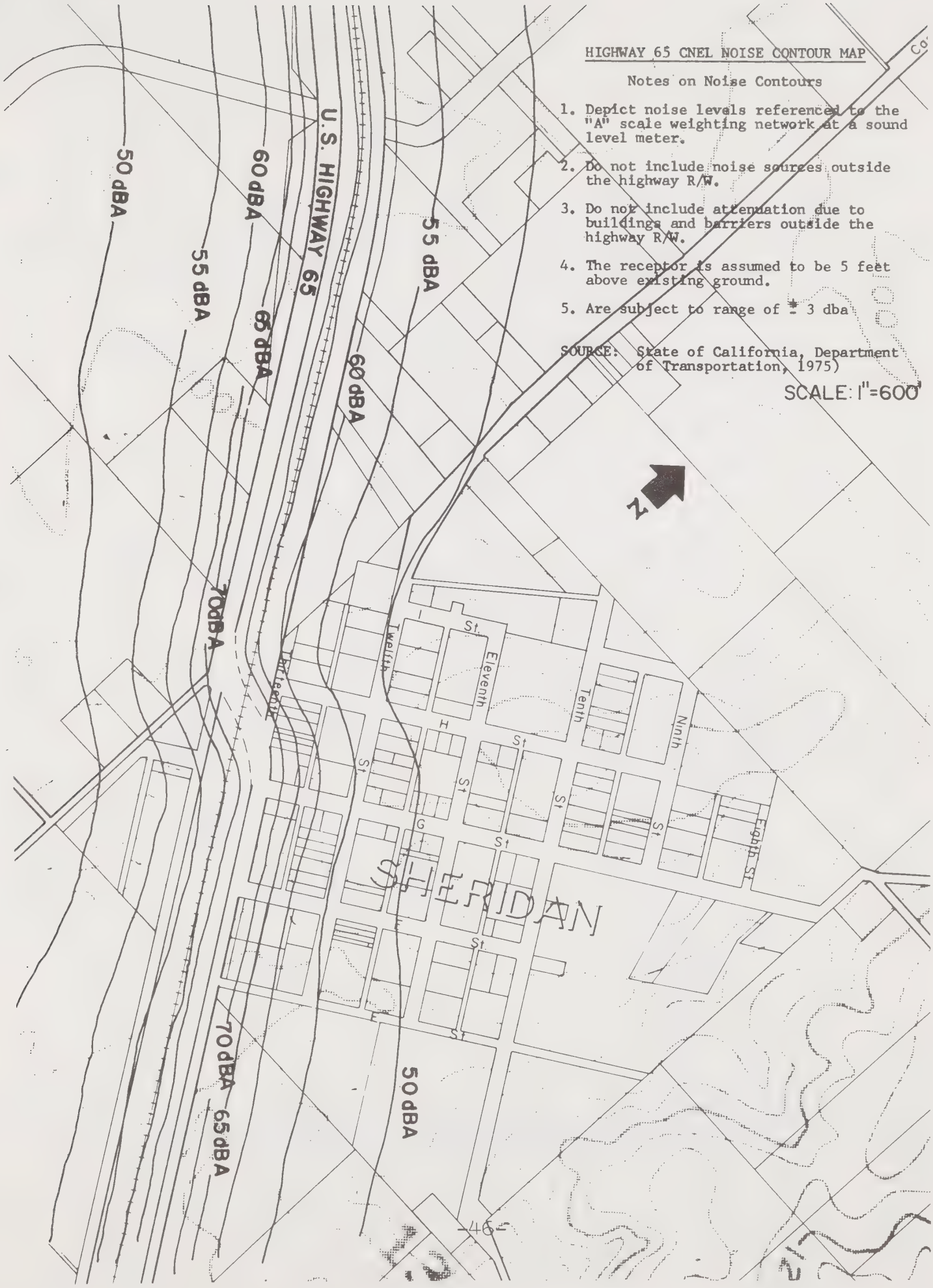
Highways 193 and 65 -- Newcastle, Lincoln and Sheridan Areas

These State Highways run through the Western portion of Placer County. Highway 193 connects I-80 and the Auburn area to Lincoln. Development along its route is generally agricultural and residential with accompanying large parcel sizes. The road is highly curved which discourages high speed.

State Highway 65 runs from Roseville north to the Yuba County line. The road is highly travelled by both passenger vehicles and trucks. The highway runs through the cities of Lincoln and Sheridan. Excessive noise is reduced, however, by slower speed limits through the developed areas of Lincoln and Sheridan of 25 mph and 45 mph respectively.

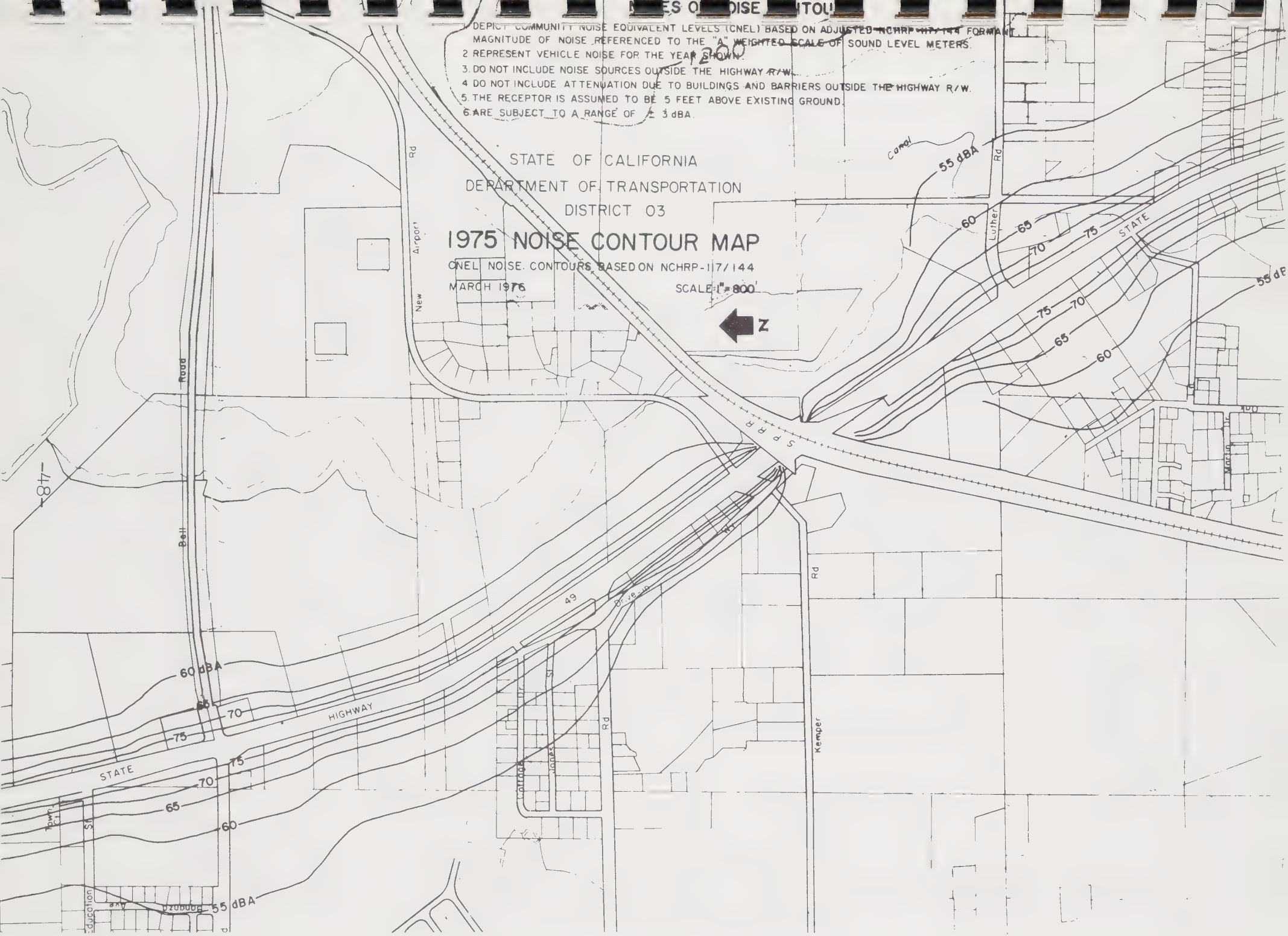

D TO THE
HIGHWAY R/W
55
60
65 dBA
65
60
55
65
60
55
55
60
55
60
65
55
1975 NOISE CONTOUR MA

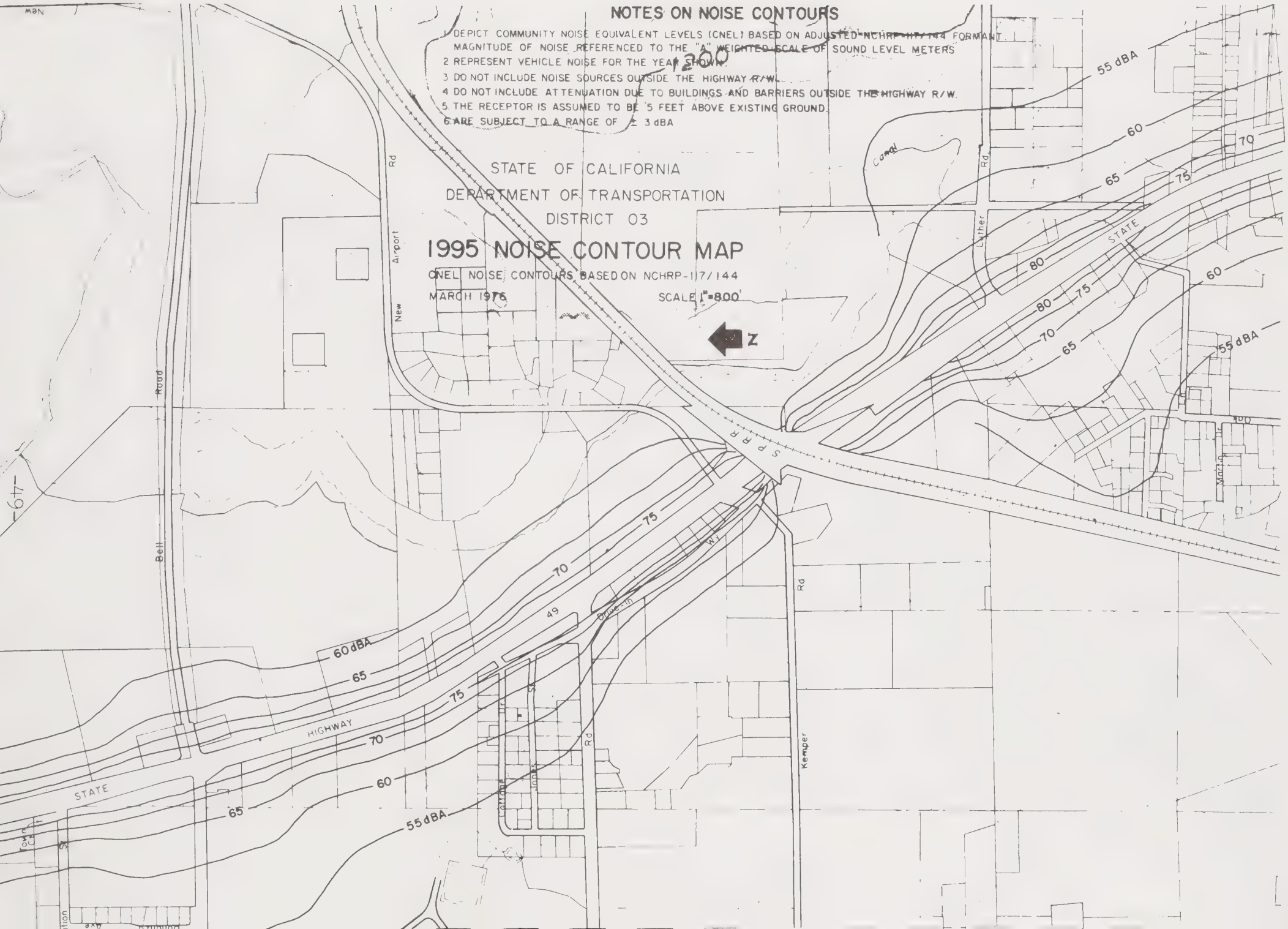

NOTES ON
D TO THE
HIGHWAY
55
55
60
60
65
65dBA
70
70
65
65
HIGHWAY
70
60
60
55 dBA
55
Blvd.
60
55
60
55
1995 NOISE CONTOUR MA


HIGHWAY 65 CNEL NOISE CONTOUR MAP
Notes on Noise Contours
1. Depict noise levels referenced to the "A" scale weighting network at a sound level meter.
2. Do not include noise sources outside the highway R/W.
3. Do not include attenuation due to buildings and barriers outside the highway R/W.
4. The receptor is assumed to be 5 feet above existing ground.
5. Are subject to range of ± 3 dba
SOURCE: State of California, Department of Transportation, 1975)
SCALE: 1"=600'
U.S. HIGHWAY 65
50 dBA
55 dBA
60 dBA
65 dBA
70 dBA
N
Twelfth
Eleventh
Tenth
Ninth
Eighth St
H St
G St
St
EL CENTRO
-46-

State Highway 49 -- Auburn Area

This highway enters Placer County from El Dorado County south of the city limits of Auburn. The highway passes through the city of Auburn, reenters the unincorporated area and proceeds to the north into Nevada County. Development along the highway, in the unincorporated area, is virtually all on the north side of Auburn. Development close to Auburn is generally of the commercial and multiple residential variety. Most residential-type uses are situated far back from the highway and not highly impacted by generated traffic noises. The speed limit through the developed area is generally 45 mpg which aids in reducing potential noise. After the highway proceeds north of Dry Creek Road, development is generally rural residential or agricultural. Few homes are visible from the highway as much of the area is held in large agricultural ownerships.


NOTES ON NOISE CONTOURS
1. DEPICT COMMUNITY NOISE EQUIVALENT LEVELS (CNEL) BASED ON ADJUSTED NCHRP 117/144 FORMANT MAGNITUDE OF NOISE REFERENCED TO THE "A" WEIGHTED SCALE OF SOUND LEVEL METERS.
2. REPRESENT VEHICLE NOISE FOR THE YEAR SHOWN.
3. DO NOT INCLUDE NOISE SOURCES OUTSIDE THE HIGHWAY R/W.
4. DO NOT INCLUDE ATTENUATION DUE TO BUILDINGS AND BARRIERS OUTSIDE THE HIGHWAY R/W.
5. THE RECEPTOR IS ASSUMED TO BE 5 FEET ABOVE EXISTING GROUND.
6. ARE SUBJECT TO A RANGE OF ± 3 dBA.
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
DISTRICT 03
1975 NOISE CONTOUR MAP
CNEL NOISE CONTOURS BASED ON NCHRP-117/144
MARCH 1976
SCALE 1" = 800'
N
60 dBA
65
70
75
55 dBA
HIGHWAY
STATE
SPRR
Airport Rd
Bell Rd
Luther Rd
Kemper Rd
Canal
Drive-in
Jones St
Town Ctr
Education Ave
48
49


NOTES ON NOISE CONTOURS
1. DEPICT COMMUNITY NOISE EQUIVALENT LEVELS (CNEL) BASED ON ADJUSTED NCHRP-117/144 FORMAT.
MAGNITUDE OF NOISE REFERENCED TO THE "A" WEIGHTED SCALE OF SOUND LEVEL METERS
2. REPRESENT VEHICLE NOISE FOR THE YEAR SHOWN.
3. DO NOT INCLUDE NOISE SOURCES OUTSIDE THE HIGHWAY R/W.
4. DO NOT INCLUDE ATTENUATION DUE TO BUILDINGS AND BARRIERS OUTSIDE THE HIGHWAY R/W.
5. THE RECEPTOR IS ASSUMED TO BE 5 FEET ABOVE EXISTING GROUND.
6. ARE SUBJECT TO A RANGE OF ± 3 dBA
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
DISTRICT 03
1995 NOISE CONTOUR MAP
CNEL NOISE CONTOURS BASED ON NCHRP-117/144
MARCH 1976
SCALE 1"=800'
N
55 dBA
60
65
70
75
80
60 dBA
55dBA
HIGHWAY
STATE
Bell Road
New Airport Rd
Luther Rd
Kemper
Canal
S P R R
Drive-In
49
Jacks
Rd

The following maps indicate noise contours for the major transportation routes in the Loomis Basin, as well as in the County: Interstate 80, the Southern Pacific route, and the heavily travelled county roads, Douglas Boulevard, Taylor Road, Sierra College Boulevard and Auburn-Folsom Road.

Interstate 80, Loomis Basin Area

Examination of the contour map shows that the 70 dB contour extends some 320' from the edge of the highway right-of-way. As with all of the contour maps in this element, deviations from this contour distance are to be expected due to the particular grade, existence of berms or heavy foliage and effect of cuts or fills through which the highway passes.

While there are several subdivisions which fall within or near the 70 dB contour approval of future subdivisions within or near the freeway should receive careful scrutiny and, where needed, be required to provide such noise attenuation measures to bring the noise reaching the subdivisions within levels of acceptability (see implementation).

The newly adopted Loomis Basin General Plan has, in most areas, reflected the concern for the protection of residential developments from noise. Along the east side of I-80, allowed parcel sizes rarely fall below 2.3 acres and often 5 acre minimums are required. Such large parcel sizes allow for greater setbacks and attenuation by foliage and air. There are areas, however, especially to the west of the freeway near Loomis, where high density development is allowed. It is in such sites that particular concern to noise abatement should be shown.

Southern Pacific Tracks, Loomis Basin Area

While trains create higher noise levels than highway traffic, approximately 80 dB at 500', the duration of train noise is comparatively short and infrequent. This is not meant to understate the negative effects of such activity, however. When trains do pass, they severely hamper social activities (i.e., conversation, t.v. viewing) and attenuation measures should be required for new subdivisions located within the 50 dBA contour.

County Roads, Loomis Basin Area

Five of the most travelled County roads are located in the Loomis Basin. Douglas Boulevard, 9612 average daily traffic (ADT), Rocklin Road, 5972 ADT, Sierra College Blvd, 5333 ADT, Auburn-Folsom Road, 5049 ADT and Taylor Road, 4273 ADT, are shown on the following noise contour map, with the exception of portions of Sierra College Boulevard, all of these County roads are two-lane. As traffic noise generated is directly correlated to traffic volume and speed, increasing the capacity of these roads by widening should be carefully examined. Widening would decrease the distance from the traffic lane to existing homes. Such a reduction in setback increases the noise received at the dwelling as per the following.[8]

Percent Loss of Setback Distance	Noise Increase
20%	2dB
29%	3
37%	4
44%	5
50%	6
55%	7
60%	8
64%	9
68%	10
75%	12

LOOMIS BASIN GENERAL PLAN • PLACER COUNTY

PLACER COUNTY PLANNING COMMISSION • 1974

CHAPTER V

GOALS

AND

POLICIES

CHAPTER V

GOALS AND POLICIES

One primary goal has been developed relative to this element: DIRECT LOCAL GOVERNMENT ATTENTION AND ACTION TOWARDS PROTECTION OF HEALTH, SAFETY AND WELFARE OF THE RESIDENTS OF PLACER COUNTY BY PROVIDING A LIVABLE ENVIRONMENT FREE FROM EXCESSIVE NOISE.

The following statements of general policy and management, along with the implementation procedures and recommendations to be discussed later, provide the most important sections of this element. These passages have been developed on the basis of information contained within this report, as well as on a general desire to protect and improve the quality of life in Placer County.

The statements of policy and management are broken down into the categories of impact, but all relate to the primary goal cited above.

General Policy and Management

- Carry on a continuing program of monitoring noise sources to assure conformance with noise standards contained in this element and imposed by subsequent County actions.
- Maintain an ongoing reappraisal of the goals, implementation procedures and recommendations of this element to assure a continuing currency with new technology.
- Recognize and take action on citizen complaints and concerns regarding noise problems in the County before such problems become unmanageable.

- Mitigate existing noise pollution where possible. Require implementation of noise abatement techniques of new projects where warranted.

Land Use

- Avoid the interface of noise-producing and noise-sensitive land uses.
- Provide the best possible environment for noise-sensitive uses such as schools, hospitals, and parks.
- Utilize the Zoning Ordinance, building codes, subdivision and Conditional Use Permit review procedures and route selection alternatives to mitigate the intrusion of unwanted noises on the community in general.

Circulation and Transportation

- Through route selection alternatives and cooperation between local and State agencies, attempt to insure that land uses adjacent to roadways are noise-free as possible.
- Regulate development within noise zones of airports to avoid potential conflict. Also, monitor noise generated by such facilities to assure conformance with State and local regulations.

CHAPTER VI

IMPLEMENTATION

CHAPTER VI -- IMPLEMENTATION

Introduction

This element should not be taken as merely an exercise in the expression of meaningless concepts and forebodings. Rather, its intended purpose is to act as a warning light to help avoid the problems attached to excessive noise and as a guide to improve the quality of our existence as affected by that intruder.

The following suggestions and standards are meant to aid the reader in attaining those goals previously established.

Highways and Roads

The control of road or highway generated noises may be controlled by implementation of a three-part approach:

1. Source emission reduction
2. Improved highway design, and
3. Land Use controls

The first two approaches are currently being implemented or enforced by Federal, State and local agencies and by private industry. The second and third approaches, improved highway design and land use controls, are the ones at which the local agency may effectively address itself.

Source emission reduction involves the development of quieter cars and trucks. While private industry is responding in the improvement of motor and exhaust noise emissions, tire noise, the major source of auto and truck noise, has not been reduced significantly.

Improved highway design involves careful attention to noise impacts in the selection of highway routes and construction. The

Federal Highway Administration in its Policy and Procedure Memorandum (PPM 90-2) and the Federal Highway Program Manual (FHPM 7-7-3) have urged that highway agencies "strive for even lower noise levels where they can be achieved at reasonable cost, without undue difficulty, and where the benefits appear to clearly outweigh the costs and efforts required". The policy guidelines contained in PPM 90-2 and FHPM 7-7-3 are directed to noise abatement in developed areas. They do not regulate noise in undeveloped areas or along existing roads, except where such roads are under Federal aid, rather this responsibility often falls upon the local agencies involved with land development and zoning.

The local agency has the duty to discourage the development of noise sensitive land uses (homes, schools, hospitals, etc.) in highway noise impacted areas should development occur, or if it has already occurred, mitigation measures should be encouraged to reduce the noise impact on the use.

Each of these components of the three-part approach to reduce highway noise impact are important as the absence of one reduces the benefits of the remaining.

Following are several techniques which the local agency may use to encourage noise-compatible land uses near roads and highways:

1. zoning
2. other ordinances such as subdivision laws, building codes, health codes, and noise ordinances
3. public ownership or control of the land
4. financial incentives

Zoning

Zoning can be a most effective tool in directing new development. It has, however, little control over existing land uses. The principle uses of zoning to ensure noise compatibility are:

1. Exclusion of typically incompatible uses such as residences, from noise impacted areas by allowing only, for example, agricultural or industrial uses.

2. Regulation of specific details of development such as building height, setbacks, buffer strips or sound insulating construction.

3. Encouragement of special development schemes such as clustered and planned unit developments to take advantage of terrain, air and structural attenuation characteristics.[14]

Other Ordinances

1. Building codes can require construction details such as acoustic insulation and sealed windows, or they can require that certain noise levels not be exceeded within a building.

2. Health codes can state noise levels which are not to be exceeded if a building is to be habitable.

3. Environmental impact statements can be required for some projects and may contain pertinent information on noise mitigation procedures.

4. Noise ordinances can bring together many of the comments and suggestions contained in this element and can prove to be a valuable tool in controlling excessive noise.

5. Responsibility for enforcement and policing of noise related problems will fall on several County agencies. Where the level of noise constitutes a health problem, the Division of

Environmental Health will have primary responsibility for monitoring and, if appropriate, mitigation of such problem. The Director of Environmental Health, or his staff as directed, shall be the initial contact person for citizen complaints. Noise regulations related to land use considerations shall be administered by both the Planning Department and Division of Environmental Health. General nuisance complaints regarding excessive noise should be directed to, and handled by, the Placer County Sheriff's Office or particular city police office based upon within whose jurisdiction the nuisance occurs.

The content of Environmental Impact Reports, where it relates to noise, shall be reviewed primarily by the Division of Environmental Health. Such review is presently based on standards generated by the U.S. Department of Housing and Urban Development. Once this element and subsequent noise ordinance are adopted by the County, they will become the standard for review.

Public Ownership

If a public agency owns the noise impacted property, it can see that it remains undeveloped or, if developed, the agency can see that it is developed with non-noise sensitive uses. Such acquisition can be accomplished by several methods:

1. by purchase, which is often too costly a proposition to be practical;

2. by process of eminent domain;

3. through a gift from a private individual;

4. as a condition of subdivision approval pursuant to proper ordinances, or

5. transfer from another governmental agency.

Financial Incentives

While this technique may not have the strength of local ownership or zoning regulations, it can be an effective means of restricting non-compatible development in noise-impacted areas.

1. Undeveloped and underdeveloped land can be assessed at a low rate so as to reduce pressures on the landowner to develop the noise-impacted lands.

2. Through a Williamson Act or Open Space Easement contract which, while not putting fee title in the name of the agency, does greatly reduce development rights.

Following are additional suggestions on abating highway noise at the source, along the path and at the receiver. Steps taken at one or more of these points may significantly reduce the noise impact.

Abatement at the Source

1. Improve road surfaces (widening, paving).

2. Reduce traffic speed in areas where noise sensitive uses exist.

3. Restrict truck traffic in areas where noise sensitive uses exist.

4. Reduce traffic volume.

5. Establish hours of operation where feasible.

Abatement at the Path

1. Incorporate depressed highways in highway planning and design.

2. Require roadside berms in combination with landscaping.

3. Limit grades.

4. Utilize the attenuation characteristics of open space.

Abatement at Receiver

1. Require through the Building Code, sufficient insulation from exterior noise.

2. Future development should be planned to insure maximum separation between noise generators and noise sensitive uses.

3. Take advantage of natural barriers (i.e., existing buildings, trees or shubbery, hills).

4. Provide for compatible use of land adjacent to heavily travelled highways.

Airports

As discussed previously, noise generated from airports may also be cause for concern. While the airports of Placer County are generally small and not responsible for a great number of complaints, the following recommendations may be used in maintaining the existing situation, in planning new developments around airports, as well as new airports themselves.

Abatement Recommendations for Airports

(Source: Department of Aeronautics, Business Regulations, Title 4, Subchapter 6, Noise Standards)

1. Encouraging use of the airport by aircraft classes with lower noise level characteristics and discouraging use by higher noise level aircraft classes;

2. Encouraging approach and departure flight paths and procedures which minimize the noise in residential areas;

3. Planning runway utilization schedules to take into account adjacent residential areas, noise characteristics of aircraft and noise sensitive time periods;

4. Reduction of the flight frequency, particularly in the most noise sensitive time periods and by the noisier aircraft;

5. Employing shielding for advantage, using natural terrain, buildings, etc., and;

6. Development of a compatible land use within the noise impact boundary.

Fixed Sources

Fixed sources of noise, usually considered to be those machines operating in factories or in construction work may cause severe physical problems to the operator if he is not protected. State and federal regulations to protect the operators of high noise-producing fixed sources are in force and removed from the local agencies responsibility. To the general public, fixed source noises are generally more annoying rather than physically damaging. Nevertheless, steps should be taken to reduce any annoyances which the source may cause. Following are some recommendations for abatement of fixed source noises:

Abatement at the Source

1. Partially or completely enclose noisy machines.

2. Lubricate moving parts.

3. Redesign equipment to incorporate noise reduction techniques (nylon or plastic gears rather than metal, pad vibrating housing).

4. Replace noisy machines with quieter machines.

5. Regulate hours of operation for noise generating machinery.

Abatement at the Path

1. Require screening techniques such as berms in combination with landscaping.

2. Require open space between the source and receiver to allow for sound reduction prior to reception (air absorbs sound at the approximate rate of 3 dB per 50').

3. Use baffling structures at property lines to reduce or disperse sound.

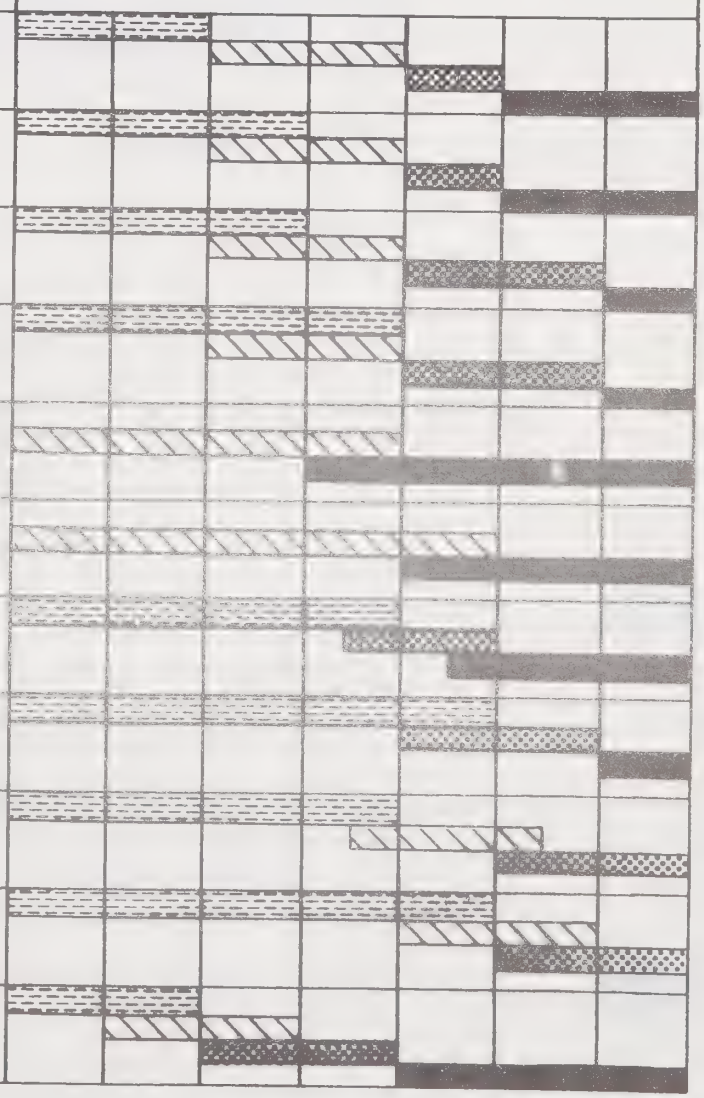
General Recommendations

1. Utilize the General Plan to incorporate the concepts provided herein as they relate to land use including the relationships between industrial uses, residential uses, route selections, parks, public facilities and agricultural areas.

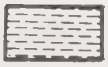
2. Utilize the General Plan and the zoning ordinance to regulate densities, setbacks, and specific uses allowed in order to maintain or improve noise impacts.

3. For each of the following land use categories, considered as both noise source and recipient, attempt to maintain exterior noise levels at or below the following levels. These levels are incorporated herein as guidelines to be used in land use decision-making.

LAND USE CATEGORY	COMMUNITY NOISE EXPOSURE L_{dn} OR CNEL, dB 55 60 65 70 75 80
URBAN RESIDENTIAL - LOW DENSITY SINGLE FAMILY, DUPLEX, MOBILE HOMES	
RESIDENTIAL - MULTI. FAMILY	
TRANSIENT LODGING - MOTELS, HOTELS	
SCHOOLS, LIBRARIES, CHURCHES, HOSPITALS, NURSING HOMES	
AUDITORIUMS, CONCERT HALLS, AMPHITHEATRES	
SPORTS ARENA, OUTDOOR SPECTATOR SPORTS	
PLAYGROUNDS, NEIGHBORHOOD PARKS	
GOLF COURSES, RIDING STABLES, WATER RECREATION, CEMETERIES	
OFFICE BUILDINGS, BUSINESS COMMERCIAL AND PROFESSIONAL	
INDUSTRIAL, MANUFACTURING UTILITIES, AGRICULTURE	
RURAL RESIDENTIAL, OPEN SPACE	



INTERPRETATION



NORMALLY ACCEPTABLE

Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction, without any special noise insulation requirements.

CONDITIONALLY ACCEPTABLE

New construction or development should be undertaken only after a detailed analysis of the noise reduction requirements is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply systems or air conditioning will normally suffice.

NORMALLY UNACCEPTABLE

New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

CLEARLY UNACCEPTABLE

New construction or development should generally not be undertake

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ACKNOWLEDGMENTS

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